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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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SOME ODDS AND ENDS MADE DECORATIVE FOR GARDEN PURPOSES.

BY ARTHUR YORKE.

TUBS AND BOXES FOR PLANTS — UTILISING A PARAFFIN CASK—A LARD PAIL—A RAISIN BOX—A SOAP BOX.

THERE is to the properly constituted mind a pleasure in finding a use for things otherwise useless, and in rendering ornamental things otherwise unsightly. I have a few "wrinkles" to offer to those who have a turn for rough outdoor carpentry, which may, perhaps, help them to this state of virtuous satisfaction, and enable them to provide decorative receptacles for plants at a nominal cost. Possibly it may appear to some that more explanation as regards material and methods of working may be desirable; and if so, I must refer such readers to my former articles on "Rustic Carpentry," at p. 247, Vol. I., and succeeding numbers.

A Paraffin Cask.—Among the objects suited to our purpose—objects which we shall require to be practically good as new, but to be less costly than the materials of which they are made—the paraffin cask may be mentioned. An ordinary forty gallon cask, standing roughly some 3 ft. high, having a diameter of some 2 ft., and made of good stout oak, costs usually 2s. 6d. I have bought such casks for less money. Sawn through the middle, the paraffin barrel makes two admirable tubs for our work. One such half is shown in Fig. 1. This it is proposed to render suitable for some large bushy plant, so it will have to be mounted on legs. The legs shown are simply so many pieces cut from rough branches. From a heap of stuff one can generally choose pieces sufficiently adapted to the purpose, though their exact contours will, of course, vary. Oak branches, technically known as "bangles," from which the bark has been taken to make tan, will do well; or if the bark is liked, apple-tree or elm boughs will be suitable. That these sticks should be rough, and gnarled, and knotted adds to their effect.

But as the tub will be only partly covered with rustic mosaic work, it will be well before nailing anything upon it to paint it. A good dark brown or chocolate will go well with the natural bark; and, after painting, we can fix on our decoration of split rods. These will have to be cut through with the saw, the lengths being too great to be safely split with the hatchet—that is, with the exception of those round the lip, which are of thicker rod than the zig-zags; say, 1½ in. as compared with 1 in. In the zig-zags the light central strip is supposed to be of peeled withy, the darker ones on each side having the bark on, and being probably of hazel. Generally speaking, wrought brads are to be recommended for fixing rustic mosaic, but where, as in the present case, the strips have to be bent over a curved surface, small wire nails will be found more secure. Groups of fir cones, as shown, will prettily ornament the triangular spaces.

Fig. 2 gives the other half of the cask arranged for, say, a dwarf shrub, an orange-tree, or the like. In small town or suburban premises, such tubs are specially useful where there is a back court into which anything green cannot otherwise be introduced. In this, it will be seen that by way of variety the tops of the staves have been sawn to a zig-zag line, which is followed a little below by a moulding of split rods. Half-way between this and the bottom a band of mosaic is arranged in light and dark strips—withy, that is—and hazel. The bits filling the diamond-shaped centres of this pattern are cut from thicker stuff than the rest, that they may project as

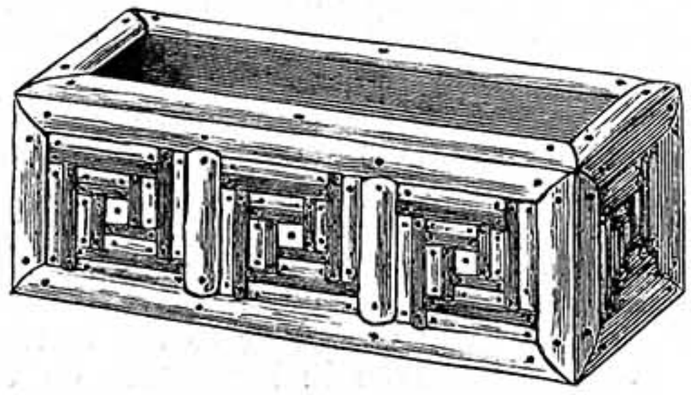


Fig. 4.—Window Box made from Raisin Box.

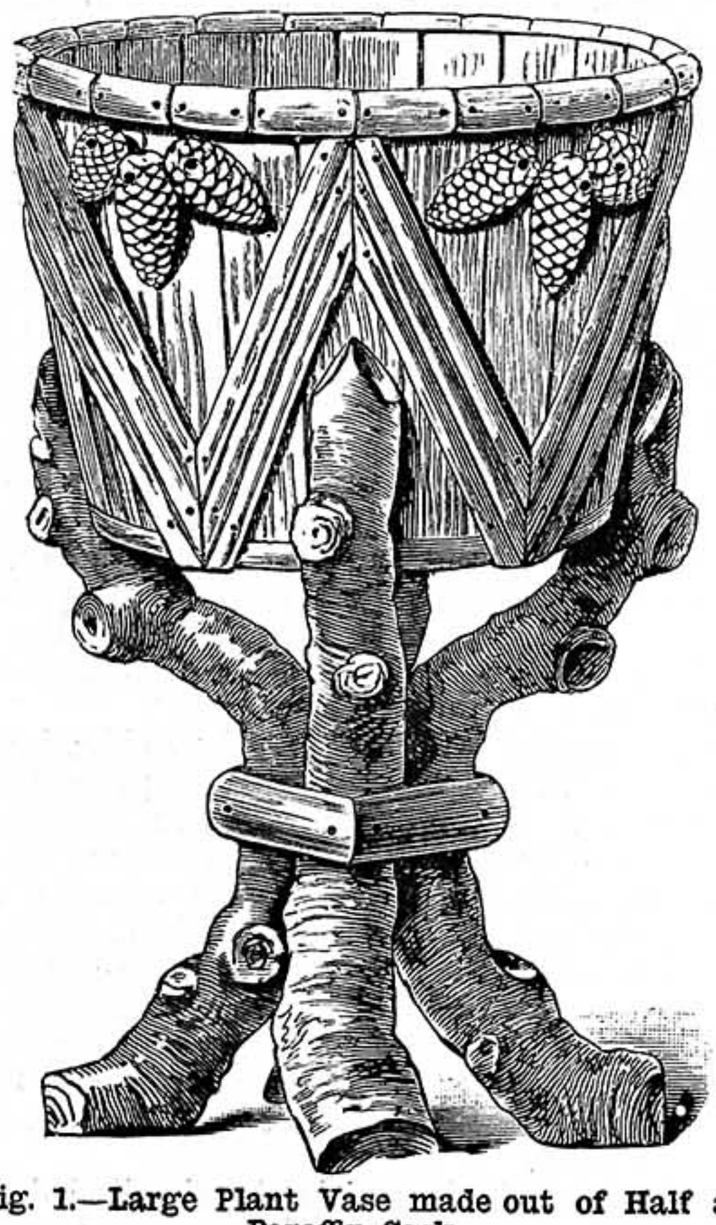


Fig. 1.—Large Plant Vase made out of Half a Paraffin Cask.

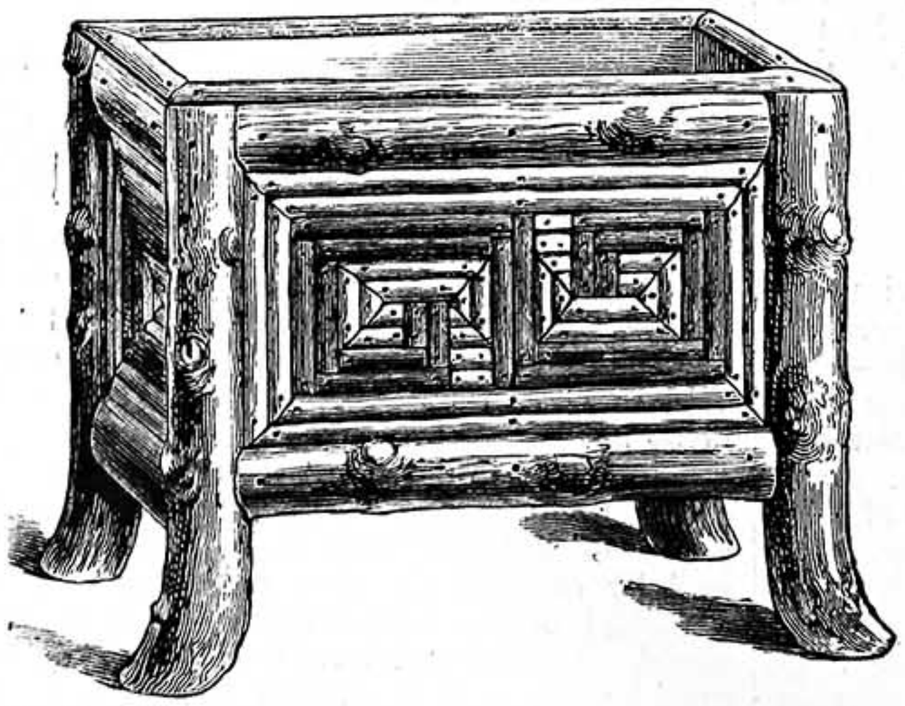


Fig. 3.—Large Garden Plant Stand made from a Soap Box or any other Strong Box.

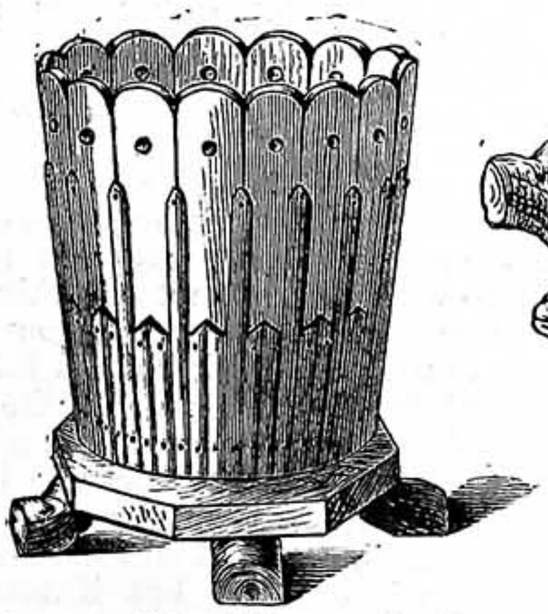


Fig. 5.—Ornamental Plant Vase made of an American Lard Pail.

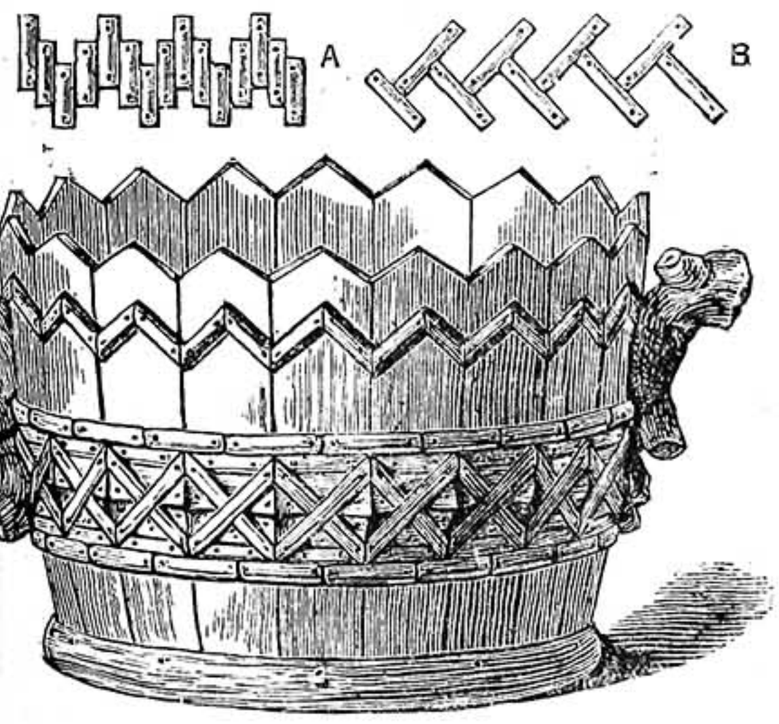
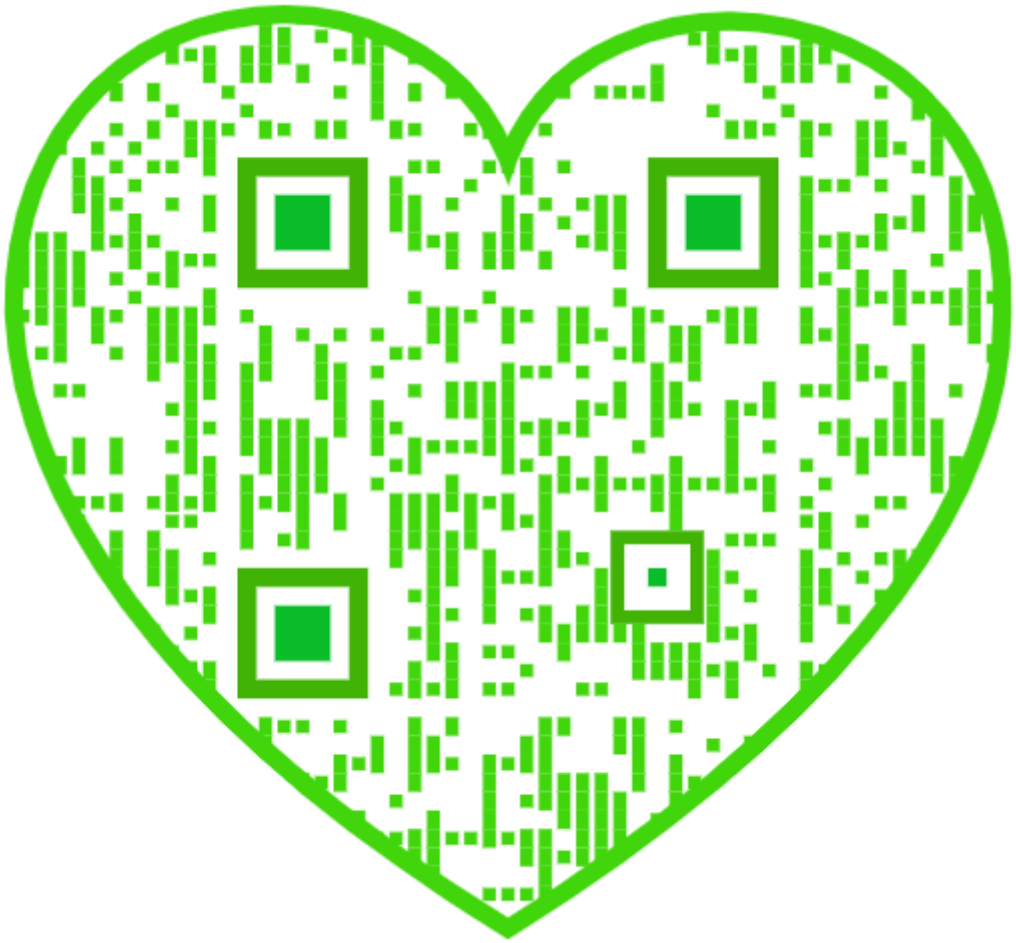


Fig. 2.—Garden Plant Tub made of other Half of Paraffin Cask—A, B, Alternative Modes of Moulding.



bosses beyond the general level. Over the unavoidable iron hoop at bottom, from which place short strips would, if nailed, be often detached, a rough "dry-cask" wooden hoop has been fixed. At the sides two pieces of rough branch stuff have been placed to serve as handles, and to resist strain these should be secured from within by strong screws.

A Lard Pail.—Fig. 5 is intended for a somewhat low-growing flowering plant—say, a large bushy geranium. In its original character this was nothing more dignified than an American lard pail, value 9d. to 1s. As in the last tub, the staves have been sawn to a more ornamental outline; they have also been perforated.

On this the ornamental strips of split rod have been arranged in straight vertical lines, to avoid the difficulty of bending and keeping them in place if bent round so small a vessel. The bottom of the pail is screwed down to an octagonal slab of wood, to the under side of which four short bits of rough bough are nailed as feet. As neither this nor the last tub are wholly covered with mosaic, they should, of course, first be painted. The slab at bottom will look very well left rough, as shown, but if painted it will be improved by strips of split rod nailed round its edges.

A Raisin Box.—Nor are some of the boxes which we can get from the grocer badly suited to our purposes. Such boxes are not costly, and to buy and knock these up for rough uses is often more economical than buying new material. A box, being straight-sided, is more easily ornamented with rustic work than the curved sides of a tub, but we must take care that the boards are stout enough to hold the brads firmly. Fig. 4 is a raisin box. That before us is about 21 in. by 7 in. by 7 in.—dimensions which lend themselves well to decoration. Two or three of these ranged side by side are not bad for the window-ledge. This box will be seen to be wholly covered with mosaic of dark and light strips in panels. Strips are also nailed on the upper edges.

A Soap Box.—In Fig. 3 we have a larger box, probably, a soap box. This, besides being completely covered with rustic work, has been mounted on legs. The easiest way to fix one of these legs on is to saw the piece of stuff in half to a distance from top equal to the depth of the box, and then to cross-cut and remove one half. The corner of the box will be brought to the middle of the cross-cut, and the leg nailed on to the *side* of the box. The piece which has been sawn off will then be cut through (quartered), and the proper quarter replaced and nailed to the *end* of the box. Frets, such as those shown in these two examples, are patterns of a kind well adapted to be worked out in rustic mosaic.

XYLONITE AS A MATERIAL FOR FRET-SAWYERS.

BY D. DENNING.

EASE OF WORKING XYLONITE—PLAIN OPEN FRETWORK—LAYING PATTERNS—POLISHING—GLUE AND CEMENT—MAKING UP—OVERLAYS—THICK INLAYS—INLAYING IN XYLONITE VENEERS—PREPARING THE SHEETS—MAKING UP INLAYS—CLEANING — FINISHING — MOUNTING TRANSPARENT XYLONITE.

IN page 787, Vol. II. of WORK (No. 101), is an article directing the attention of readers to the wonderful material known as Xylonite. In it mention is made of its use to fret- and marquetry-cutters, and as there is good reason to know that a very large number of readers of WORK are interested either professionally or as amateurs in fretwork, no doubt a few practical suggestions on the use of xylonite for their special craft will be welcome. I have purposely not referred to our readers as marquetry-cutters, for the fact is this beautiful and artistic art is not practised to the extent it might be by amateurs who are proficient in manipulating the fret-saw. That many try inlaying with one or even two colours cannot be denied, but this kind of work is by no means on an equality with marquetry. One reason that may operate against the popularity of this art as a pastime not only for men, but for women, is probably due to the scanty information of a practical kind which has been published. Another, and the one which is more immediately connected with the subject of this paper, is the difficulty in working with the materials used. These, as is well known, are wood veneers, and those fret-sawyers or would-be marquetry-cutters know equally well that if they have tried to make inlays with them according to the instructions generally given in handbooks on the subject—viz., by gluing alternate sheets of paper and veneer—that they have signally failed. Even if the veneers, being brittle, have not broken while they are being sawn, they have done so when an attempt has been made to separate the various layers. I am far from saying that ordinary veneers cannot be used with success for inlays of two or three colours, but still they require tender handling, for there is no getting away from the fact that they are easily broken, and it is almost a matter of impossibility without considerable skill to manipulate small pieces, perhaps not $\frac{1}{16}$ in. wide, without breaking them. In any case, with the ordinary treadle machine, even with such a good one as the Britannia Company's No. 8, it is difficult to cut them without annoying fractures happening. This must be the case with any material which has a grain like wood or is brittle.

Now xylonite is free from these objections, or rather, I should say, from these properties, of wood. It therefore offers an excellent material for the amateur or occasional marquetry-cutter, as little beyond capacity to saw accurately and to a line is necessary. For similar reasons the inlayer using only two colours will find it an admirable material.

Before, however, proceeding to give any hints to these more advanced workers, the plain fret-cutter must not be forgotten or overlooked.

As stated in the article already alluded to, xylonite is to be had in a great variety of appearances, so that the fret-worker can take his choice as to colour, etc. In the actual working there is no practical difference between any of them. Malachite, ivory, amber, etc., etc., are all cut and manipulated with equal ease, so that the appearance of the material has nothing to do with its treatment.

On a No. 8 machine of the Britannia Company I have cut xylonite of the greatest thickness in which sheets are made—viz., 1 in.—with ease, so that any thickness may be considered workable. Of course, few will care to use it so thick as this for fretwork. Indeed, for this purpose a thickness of $\frac{1}{8}$ in. is probably the most suitable, as, owing to its value, only small things are likely to be made from it. When little things are made of fretwork, we all know how liable they are to get broken; but if made of thin xylonite, they are even more durable than if made of comparatively thick wood.

The material requires no special treatment in sawing, and is bored and worked in the usual way. It is, however, so soft that those who are accustomed to work in hard wood must be on their guard that their work does not "run away" with them, which simply means that xylonite must be treated with a light hand and fed gently to the saw. I am assuming that this is worked with a machine, but the same broad rules apply with a frame. Those who are accustomed to fret-sawing will understand me when I say that two sheets of, say, $\frac{1}{8}$ in. thick can be cut together as easily as one; in fact, I am not sure that I do not prefer to cut through a thickness of $\frac{1}{4}$ in., as this is more rigid. This thickness can easily be cut with a No. 1 blade, but there is no reason why a larger should not be used, as the material cuts so cleanly that even a No. 5 or No. 6 will leave smooth edges, without any rugged "burr," of which there can be none.

If edges want trimming at all afterwards to remove irregularities caused by faulty sawing, the ordinary small files may be used, but they are not necessary, as the blade of a penknife may be used with almost greater ease and advantage either to cut or to scrape.

Perhaps something should be said about laying the patterns on xylonite. I find the best way is to stick them on with ordinary flour paste—at least, this is as good an adhesive for the purpose as any, though I sometimes use glue. The paper remaining can easily be washed off without the trouble of rubbing with glass-paper, as water does not affect xylonite. A piece of fret can therefore be laid in some till the paper comes away without trouble.

As the sheets are not polished, nor yet perfectly smooth, when supplied, the frets must be finished off afterwards—first by smoothing, and then by polishing. To make the surface uniformly smooth, glass-paper of varying degrees of coarseness may be used, the finest, of course, being last. The polishing is best managed by means of a calico wheel or buff, with pumice powder and oil in the first place, and then finely powdered whiting with just enough oil to prevent the dust flying about. Unless a good deal of the surface has to be removed, it will be seen that the pumice powder renders the use of glass-paper or scraper unnecessary. It is not, however, every amateur who has a suitable wheel, and even if he has a lathe to which one might be attached, he may not care to run the risk of damaging it with the pumice. Those who cannot do their own polishing will be glad to know that the Xylonite Company will do what is necessary at a very moderate charge, and, from having experienced assistants at this kind of work, they certainly put a better finish on than could be managed by those who are inexperienced. I certainly recommend those who have made anything they value to send to the manufacturers, as the small cost incurred is neither here nor there when the improved appearance of the work is taken into account. Fretwork articles should be sent in pieces, and not made up.

Those who do not care to go to this trouble or expense may be glad to know that small pieces of xylonite may be polished fairly well by rubbing them on a piece of cloth stretched over a board instead of a calico wheel. The labour, however, is somewhat considerable, and the result not altogether satisfactory.

It will be noted that the polish is got by

friction only, and not by the application of a varnish of any kind. In connection with this, I may say that French polish should not be used on xylonite, the manufacturers of which make a special varnish which is sometimes used on common articles by themselves. They inform me, however, that they are willing to supply it in small quantities to myself and friends, who for present purposes may be regarded as including all readers of WORK. The varnish can be applied by anyone, and to forestall inquirers in "Shop" as to its ingredients and the way it is made, I may as well say that I cannot tell, for it is a trade secret which, in the interest of the manufacturers, it would be unfair to divulge. Readers who are acquainted with me know my opinion generally on "trade secrets," but to explain this one would be a breach of confidence; therefore nothing more need be said in excuse for my reticence in the present instance. Possibly some readers may be able to concoct or find some varnish suitable for the purpose; but if they take much trouble in doing so, they will be "penny wise, pound foolish."

When making up articles of fretwork, it will be well to note that though soft edges, etc., cannot easily be shot in the ordinary way with the plane, if this is very finely set they may be, but ordinarily it is easier to do what is necessary by filing or grinding. Another important matter that must not be overlooked is that glue is not suitable for joining pieces of xylonite. Possibly india-rubber cement might do, but the best adhesive is undoubtedly that used by the manufacturers themselves. It is a liquid, and is applied like ordinary glue, but care should be taken not to apply it too thickly if a neat joint is required, nor yet to let it get on any polished surface. It is made in two forms—opaque white for white material, and clear for others—and may best be described as a liquid xylonite. It will be supplied in small quantities to my "friends," and the remarks in connection with the varnish may be applied also to the cement. It seems to act rather by partially dissolving surfaces to which it is applied, and so causing union, than mere adhesion. On this point I cannot, however, be certain; but the stuff is most tenacious, whatever its precise action; it dries very quickly.

Overlays of fretwork are not very easily laid with glue alone; though, if only a slight hold on the wood is required, glue may answer, especially if aided by a few needle-points. Glue, however, is apt to flake off from xylonite, so that the adhesion cannot be depended on. A better way is to coat the back of the fret with the special cement and to touch the wood here and there with glue, and for this purpose I prefer Le Page's to the ordinary kind. A still better plan is to coat both the back of the fret and the surface of the wood with the cement, and then bring them together under pressure. The appearance of the wood is very little altered by the cement, which goes further if size has been previously used.

As $\frac{1}{4}$ in. can be cut easily, I have fastened two pieces together to make this thickness with small wire nails in the waste, a piece of thick paper being between the xylonite. This has been fretted in the usual way, so that the paper gives a perfect pattern. By sticking this afterwards on another piece of xylonite it has been used to cut the pieces for inlaying into the other. This is approaching very closely to the method of marquetry cutting, inasmuch as the pieces to be inlaid are cut separately, so that objectionable drill-holes are not observable, all points and corners being preserved in their integrity. When sticking the cut-through paper pattern, care must be taken that it is not stretched, as, if it were, the pieces, however accurately cut, could not fit properly without a good deal of filing and cutting. If the glue be applied to the xylonite, and the paper laid flat down on it, I have not found any difficulty from the paper stretching as would be the case were glue or paste to be rubbed on the paper. May I remind readers that the width of the saw kerf must be allowed for when cutting the inlay pieces, so that it would not do to saw within the paper on the bare material? The saw should cut through the paper just at the edge, so that none of it is on the inlay pieces. By this means the saw-cut or kerf is entirely in the waste, which in this case is the reverse to what it was in the original. Of course, to manage this plan, it is presupposed that the sawyer has considerable skill in cutting accurately to a line. For the beginner to attempt it would simply mean a waste of good material, and he had better adhere to the time-honoured plan of cutting both pieces through at once. By the plan advocated many little nicknacks in which both sides show, such as paper-knives, can be made in duplicate, not only so far as pattern is concerned, but also in colour of material, with the smallest possible amount of waste. With such inlays, it is not necessary to stick them on paper while inlaying. It is sufficient to touch the edges with the xylonite cement. As it may happen that the two materials, say ivory and tortoiseshell—of course, I refer to the imitations of the substances—which have been combined as an inlaid piece of work are not of exactly the same thickness, the surface must be made level. This may be done with glass-paper, but it is a tedious job, and I have found nothing better for the purpose than an ordinary cabinet-maker's scraper, well sharpened. If it is blunt, it is bad enough on wood, but on xylonite it is worse.

For ordinary inlaying in only thin stuff which has to be mounted on a backing of solid wood, xylonite of about $\frac{1}{25}$th in. does as well as anything. By the way, I may here state that this thickness would be expressed by the manufacturers as $\frac{4}{100}$ths of an inch, as they have in this respect adopted the decimal system, with the inch as the standard unit.

This thin or veneer xylonite may be cut in the manner common to marquetry-cutters, or it may be simply cut through several sheets at a time, after the plan usually practised by amateurs. In either case, the great advantage xylonite has over wood is that the finest fret can be done in it without danger of breaking. I am now engaged on an elaborate piece of work, consisting of tortoiseshell and ivory alternately, and, as a description of my plan may be useful, here it is. I have no "trade secrets," and my methods are at the disposal of all readers of WORK. If they can find better, perhaps they will be good enough to send on explanations to the Editor. I am using the thin material mentioned above, with a No. 8 Britannia machine and No. 1 saws of the ordinary kind. Five thicknesses are cut through at a time, so that for each set of panels prepared there are two of tortoiseshell inlaid with ivory, and two "counters" of ivory inlaid with tortoiseshell. The fifth sheet is waste, unless I afterwards use it as an overlay. It should perhaps be mentioned that for the article in question I require two panels of each pattern, otherwise only three sheets would be cut through at a time.

The panels having straight edges are cut from the large sheet of xylonite, by scoring it with the point of a penknife, guided by a straight-edge. When partly cut through, the stuff can be split at the cut. By this means the trouble of sawing is avoided, and straight, clean-edged pieces are got at once. The sheets are then glued together alternately, the top and bottom one being of the same material, which, in this instance, is ivory. Between each two is a sheet of paper, as I find they hold better than when glued directly to each other, and the paper allows the small pieces to be separated more easily than they otherwise would be when they are to be inlaid. The glue is put all over, and not merely in patches, so that when the sheets have been kept together by pressure till the glue is dry, which takes some time, they form a good solid block which is very pleasant to cut. In sawing, the "tilting table" is made use of to a slight extent, and though many parts of the pattern are little, if any, more than $\frac{1}{16}$th in. wide, while some are less, I have not had a single mishap in the way of the material breaking or tearing with about a dozen panels, each containing from fifty to seventy holes. This could not be said if ordinary wood veneers had been used, for if some of them had not been broken while sawing, they certainly would at some subsequent part of the process, such as when separating the sheets. This I do by putting the block in water till the sheets come apart, or by inserting the blade of a knife between them, and afterwards washing the paper off.

They are then ready for inlaying. The little pieces, of course, are all in their proper order and in blocks of five thicknesses just as they were sawn out. On a sheet of paper in front of me are the four frets, the top one having been discarded by now, as it has served its purpose, which is merely to allow of the small pieces to be let into the sheet next in order being cut from it. As each block of the small inlay pieces is taken up, the corresponding opening for it has some glue dabbed down in it, and each small piece, easily separated from the others either with the thumb-nail or a penknife blade, is pressed down in its place. A quantity of glue oozes out, and by the time the inlays are done the sheets present anything but an inviting appearance. This, however, is of no consequence, and the next thing to be done is to clean off all the glue and waste paper. This is managed by putting the sheets on a smooth, flat surface, with the papered sides downwards, and then washing them with a rag or nail-brush. This, of course, not only removes the glue, etc., from the surface, but also from between the pieces, and some care must be exercised not to wash away small pieces. If any do get accidentally displaced, they are easily put back. Although thoroughly wet, the inlaid panel with the paper under it can easily be raised and turned over without injury, when the other side can be washed in the same manner. Superfluous moisture is now removed, and a sheet of glued paper is stuck down on the panel. It can now be handled with impunity, and be laid aside to dry to be mounted on solid wood. This is done in the usual way, the only slight differences with xylonite being that it is not necessary to go over it with the toothed plane. It is stuck down with the cement or solution already referred to applied to the inlay, and ordinary glue to the wood. To ensure perfect contact, the sheets of

xylonite should be laid with a caul. After adhesion is perfect, the paper may be removed with a damp rag, but, to prevent the glue being injured, the quantity of water should not be so great as before. After this has been done, the inlay can be finished off by polishing, with perhaps a preliminary touch or two with the scraper to level it thoroughly. If any small bits get accidentally lost, as they sometimes will, the ordinary stopping of resin and wax does admirably for deficiencies in the tortoiseshell, while plaster of Paris or whiting answers the same purpose for the ivory.

The reason why it is recommended that the sheets should be stuck together all over while being sawn, and not merely fastened here and there, is that the burr caused by the drill on the under surface of each is objectionable, and, altogether, loose sheets are not so pleasant to cut as when they form a solid block.

By adopting the simple means described, any tolerably skilful fret-cutter may aspire to make things of greater beauty and artistic value than he has probably had any idea of when working in wood alone.

It may be a useful hint to the inlayer or marquetry-cutter using xylonite that the beauty of tortoiseshell, amber, and other transparent or semi-transparent substances, is partly lost unless they are laid on white background. As it is not always convenient nor suitable to the article to mount them on white wood, the desired result may be obtained by having a piece of white paper between the ground and the inlaid sheet of xylonite, which, of course, has thus a white backing given to it.

I trust these remarks may have not only the effect of inducing fret- and marquetry-cutters to try a charming material which seems specially adapted to their requirements, but also of enabling them to use it with some degree of certainty, instead of having to find out the best treatment by experiment. That the subject is exhausted I do not pretend, but the points on which the amateur or professional worker is likely to require information have, I think, all been attended to. If anything essential has been omitted, I shall be happy to answer inquiries in "Shop"; but please do not ask me to explain how you can make your own xylonite at home, for it cannot be done.

A FOLDING PLATE DRAINING RACK FOR PHOTOGRAPHERS.

BY CHARLES A. PARKER.

SIZE OF PLATE DRAINING RACK — PREPARATION OF THE LEGS—CUTTING THE REBATES TO TAKE BARS AND STAYS—CROSS BARS—PUTTING TOGETHER TWO HALVES OF RACK—HINGEING RACK TOGETHER—CUTTING AND ATTACHING V-SHAPED GROOVING TO COMPLETED RACK.

AN amateur who has attained some little proficiency in the art of wood-working, and can manage to put together simple framing, generally experiences a desire to lessen the cost of his photographic requisites by constructing some of the less important items himself, as there are many articles that constitute the paraphernalia of a photographer that are not only expensive when their simplicity of construction is taken into consideration, but which come well within the scope of the amateur workman, without involving such manual labour as would be apt to lead to failure. A folding plate rack, which is shown in Fig. 1, is an indispensable dark room accessory that can readily be made by any amateur wood-worker in a very short space of time. The size described below is such as is usually employed for 3¼ by 4¼ in. or 5 in. by 4 in. plates, but it may best be said that a rack suitable for half or whole plate negatives can be constructed by simply adding a couple of inches to the length of the legs below described. From an ½ in. board—preferably a piece of straight-grained yellow pine—cut off four narrow strips ¾ in. wide and 7 in. long, with one end of each strip sawn off to an angle of 45°, this latter being done on a mitre-cutting board. The other end of each strip will now require to be rebated, as shown in Fig. 2, the length of the rebate being 1¼ in., and the depth ¼ in. The simplest method of cutting this rebate is to

Fig. 2.

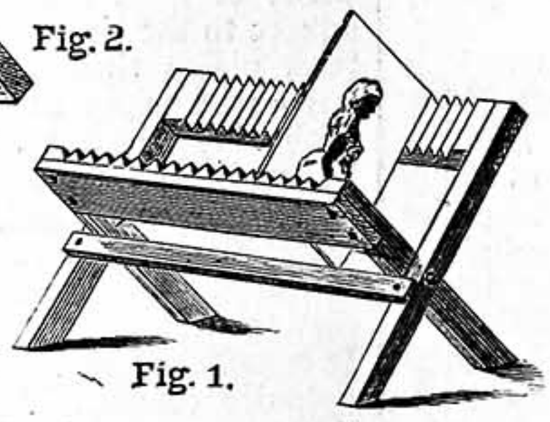


Fig. 1.

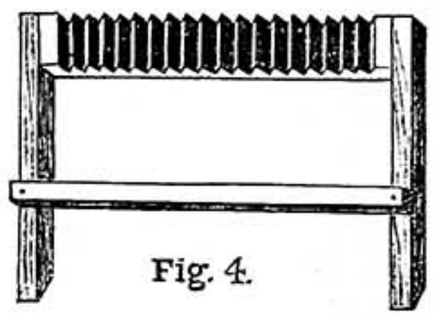


Fig. 4.

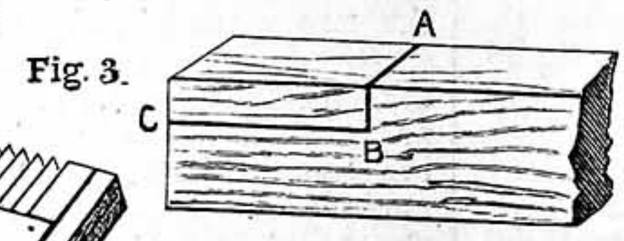


Fig. 3.

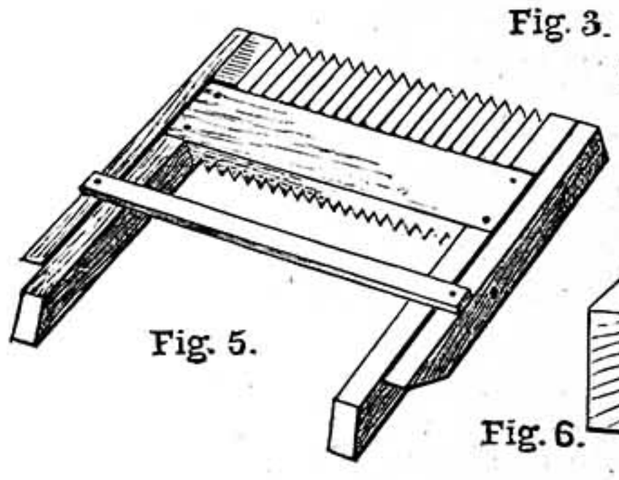


Fig. 5.

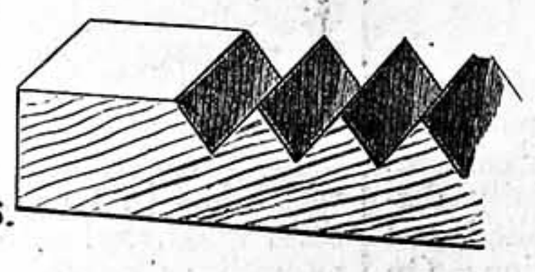


Fig. 6.

Fig. 1.—Folding Plate Draining Rack complete. Fig. 2.—Leg of Rack rebated. Fig. 3.—Mode of cutting Rebate. Fig. 4.—Grooved Strip at top of Side. Fig. 5.—Rack when folded. Fig. 6.—Mode of grooving Strips.

make a saw cut, ¼ in. deep, at the above distance from the end, as shown at A to B, Fig. 3, and another from C to B, which will thus remove the requisite amount of wood. These pieces, which are intended to form the legs, may then be placed aside while a couple of cross bars are being prepared to fit across the rebated portions of the legs for the purpose of uniting them. These may be cut from a strip of ¼ in. board 1¼ in. wide, one of them being 9 in. and the other 10 in. in length. When ready, take two of the legs first prepared, and glue one of them at each end of the 10 in. strip, using a couple of ½ in. brass screws to each leg, and after these have been fixed in position, glue and screw a thin strip of wood, ½ in. wide, across from side to side, in the position shown in Fig. 4, placing this stay at 4⅜ in. from the upper end of the limb. The other cross piece and the two remaining legs are then screwed together in a similar manner, except that this limb will not require a stay to be placed across, as in the case of the other. The two limbs are now placed together in the position they are intended to occupy when the rack is closed; after which they are hinged in the middle by driving a ¾ in. round-headed brass screw through the side of each outer limb, at a distance of 4 in. from the top of the rack, as will be understood by reference to Fig. 5, which represents the rack when closed. Upon opening the rack, it will be found that the strip of wood placed across the lower portion of the outer limb forms a stay which prevents it from being opened too wide, and likewise renders it rigid when in use. When the rack has been fitted together in the manner above described, the upper portion of each limb must be furnished with the grooves to hold the plates. Suitable grooving wood can be purchased from most photographic dealers at 10d. per foot for 11 in. wide. Should any difficulty be experienced in obtaining the grooving, it will be found an easy matter for the reader to cut sufficient for this rack. In short, the reader is strongly advised to adopt this course, as the grooving supplied by the dealers being specially intended for plate boxes, is therefore scarcely suitable for our purpose, owing to the grooves being formed thus: U, instead of the V shape recommended; consequently, a freshly-developed negative in careless hands would stand a good chance of getting the thin edges torn or damaged. Take a piece of ⅞ in. board 8 in. wide, and saw off a couple of 1¼ in. strips across the grain, afterwards gluing these into the upper portions of each limb of the rack; and when the glue has set, proceed to cut a series of twenty-four V-shaped grooves by means of a sharp 1½ in. chisel, a saw, or a knife, having previously marked out the exact position of each groove on the edge of the wood, so that they may exactly correspond. The grooves for the inner limb of the rack occupy the full length of the space, which is 8 in.; but for the outer limb, which measures an inch more in length, there will be ½ in. plain space at each end before the grooves commence, as is clearly shown in Figs. 1, 4, and 6. When the grooving has been provided, the rack will be finished, thus completing a very useful article on which to place negatives out of harm's reach after the operations of washing or varnishing.

THE ACCURATE DRAWING OF SCREWS.

BY P. B. H.

HOW TO DRAW A SINGLE V-THREADED SCREW, A DOUBLE V-THREADED SCREW, A SINGLE SQUARE-THREADED SCREW, A DOUBLE SQUARE-THREADED SCREW, A DOUBLE SQUARE-THREADED NUT (IN SECTION).

IN WORK, No. 109, I finished by showing how a spiral line was drawn round a cylinder, and with a promise to show how the threads of a screw are drawn accurately.

As a first example, Fig. 14 shows the ordinary single V-threaded screw, 1½ in. diameter. Now, if we turn to a table of Whitworth threads, we find that a screw of the above diameter has six threads to the inch—that is to say, the pitch, or the distance between two threads, will be ⅙th of an inch.

Draw a horizontal line, A B, as a base from which to commence. On this line, slightly to one side (the left hand preferably) of where the screw is to be drawn, set up a vertical line 1½ in. long (this height

depends altogether on the length of bolt to be drawn), and, commencing below, set off distances on it equal to the pitch—that is, $\frac{1}{8}$th of an inch, which will exactly divide the line into nine equal parts. Subdivide these divisions into $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$, as shown, making a small vertical scale. The number of divisions the pitch is divided into is not arbitrary, but always let them be even in number. For this pitch of screw, eight divisions are ample, more being scarcely distinguishable. Number the pitch divisions on the scale 1, 2, 3, etc., as shown.

Now, a short distance to the right of scale, and following instructions given in describing Fig. 3 (p. 70), design the outlines of a V-thread $\frac{1}{8}$th of an inch pitch, commencing with the exterior angle (*c*) of the thread on the line A B. Of course the points *d*, *f*, etc., can be projected by the T-square from the scale. Having done this, from the line *a a*, passing through the extreme rounded portion of the thread, set off $1\frac{1}{2}$ in. to the right. This will be the diameter of the bolt. Construct here the outlines of the V-thread similar to the one on the left; but care must be taken that the exterior angles do not come *opposite* those on the left side, but *midway* between them. This can be easily done by projecting lines across from the $\frac{1}{2}$, $1\frac{1}{2}$, $2\frac{1}{2}$, etc., divisions of the scale on to the line a^2 a^2—these will give the vertical position of the angle points of the threads. The reason is, that in single-threaded screws, in winding once round the body, the V rises from *c* to *e*, therefore, when it gets half-way round (that is, to *d*), it will have risen half the distance *c e*—that is, one-half the pitch.

Having drawn the outlines of the thread on both sides, it is now necessary to obtain the path of the line joining them. To do this, we must proceed almost in the same manner as we did in Fig. 1. Below A B draw two concentric semicircles centrally below the bolt, one being the same diameter as the bolt, the other as the bolt at the bottom of the threads. Divide these into four equal parts—the divisions of the outer circle being numbered *a*, a^1, a^2, etc.; those of the inner one, *b*, b^1, b^2, etc. From all these points set up perpendiculars, *a a*, a^1 a^1, *b b*, b^1 b^1, etc. As all the lines, *c d*, *e f*, *h i*, *k l*, etc., follow one and the same curve, I have shown the construction lines for *k l* only. I have done this to prevent confusion, as in the lower part of the figure I show the path of the spiral, which is unseen. To proceed, then: the point *k* is

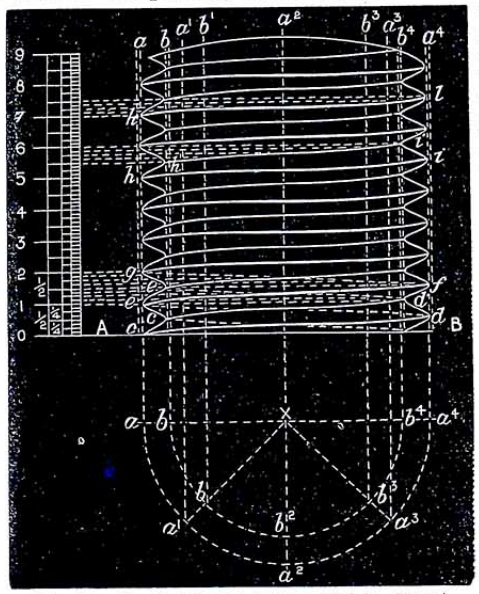


Fig. 14.—Single-Thread V-Screw ($1\frac{1}{2}$ in. diam.).

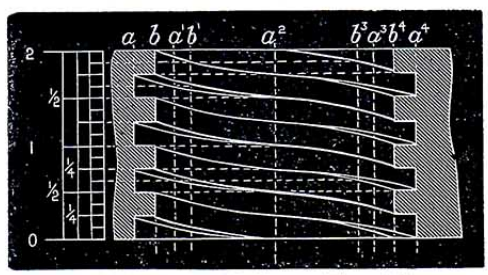


Fig. 18.—Nut for Double Square Thread Screw.

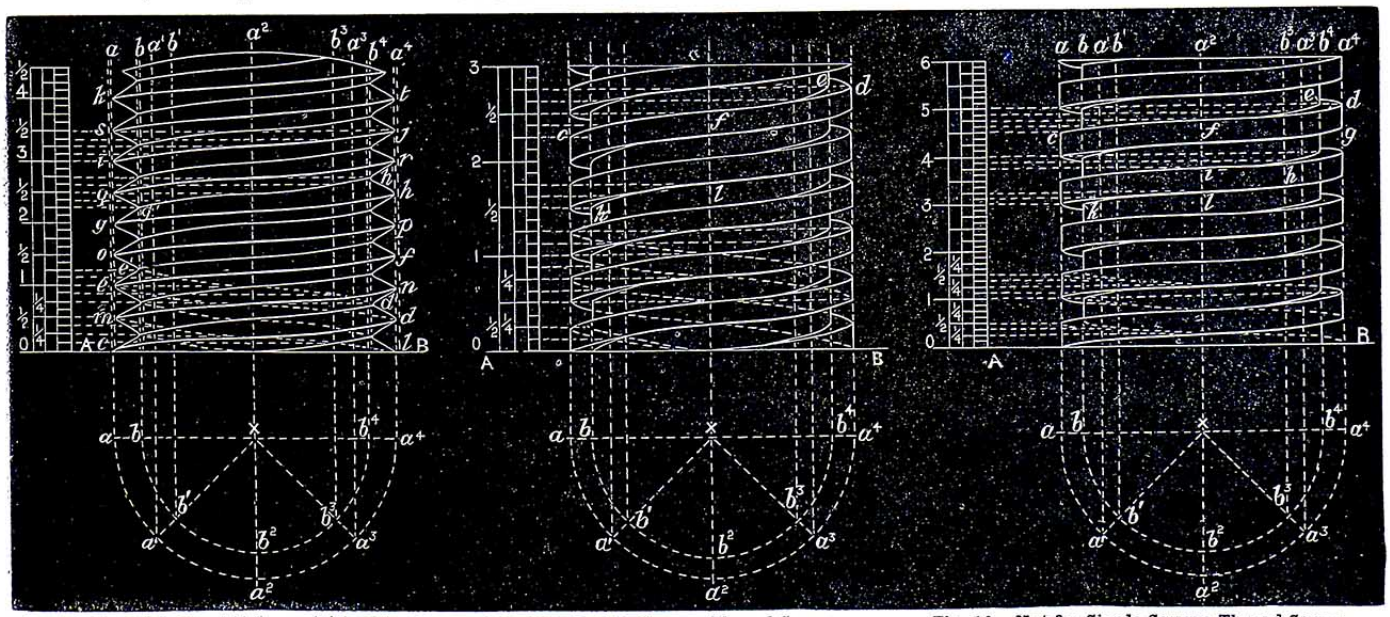


Fig. 15.—Double-Thread V-Screw ($1\frac{1}{2}$ in. diam.).

Fig. 17.—Double Square Thread Screw.

Fig. 16.—Nut for Single Square Thread Screw.

opposite 7 on the scale; the point *l*, half the circumference of bolt, is opposite $7\frac{1}{2}$, which is half the pitch. Draw dotted lines from those points to *k* and *l* respectively. A line from $7\frac{1}{8}$, cutting the line a^1 a^1, which is drawn from the point a^1, $\frac{1}{8}$ of the circumference of the bolt, will be a point in the curve wanted; a line from $7\frac{1}{4}$, cutting a^2 a^2, will give another; and from $7\frac{3}{8}$, cutting a^3 a^3, will be another. A line drawn by hand from *k* to *l* through these points will give the path of the thread at the circumference of the screw. The same method can be followed for the bottom of the thread, h^1 i^1, but in this case the horizontal lines from the pitch must cut the vertical lines drawn from the points of division on the smaller semicircle, which is equal to the diameter of the bolt at the bottom of the thread—that is, wherever the horizontal lines from 6, $5\frac{7}{8}$, $5\frac{3}{4}$, $5\frac{5}{8}$, and $5\frac{1}{2}$ cut the vertical lines b^4 b^4, b^3 b^3, b^2 a^2, b^1 b^1, *b b*; these are the points through which the spiral line must be drawn from h^1 to i^1.

I also show the construction lines for obtaining the spirals as they wind behind the screw from *f* to *g* and d^1 to e^1 respectively. I shall not describe these; I shall presume that my readers will be able to understand them with a little thought.

Fig. 15 shows a double-threaded V-screw, to draw which we proceed as in Fig. 14. A scale similar to that one will be found convenient, but as a second thread now winds round between the first, the pitch of the thread must be doubled to allow of this, and as each thread will now rise double what it did at first while travelling the same distance, the pitch must be doubled too. Therefore, draw the pitch on the scale equal to $\frac{1}{4}$ of an inch, and divide it into eight equal parts as before. Now, though we have doubled the pitch, we must still keep the size of the thread the same as in the preceding figure; we must not design it again from the increased pitch, according to Fig. 3 (p. 69). Draw the left-hand side of the screw exactly the same as in Fig. 14, commencing with the angle of the thread, *c*, on the line A B. Now, as there are two threads, one will always be half the pitch in advance of the other—or, we will say, half a revolution; therefore, the point *l* will represent the commencement of the second thread, being half the circumference from *e*. It will thus be seen that, contrary to the preceding Fig. 14, the exterior angles of the threads come exactly *opposite* each other in this case, and not *midway*, as in the last case. Having drawn all the outlines of the threads, draw all the construction lines and semicircles as before, lettering them the

same. I have marked the one thread commencing at *c* by the consecutive letters of the alphabet at the exterior angles, as—*c*, *d*, *e*, *f*, *g*, etc.; the other, commencing at *l*, as *l*, *m*, *n*, *o*, *p*, etc., so that the reader will not get confused. I have shown construction lines for obtaining the spirals, and I think no further explanation of Fig. 15 will be necessary.

I might here remark that, having once obtained by construction the spiral line, *k l*, the other similar lines might be drawn by the aid of a French curve, if a part thereof could be found to exactly coincide with the line. If a piece could not be found to coincide with the whole of the curve, there would be no difficulty in finding a part for the half of the spiral. In this case it would only be necessary to mark the point on the centre line, a^2 a^2, where the spirals cut it; when, after drawing the halves of the similar spirals down one side, turn the drawing round, and reproduce the others by the same piece of the curve, as they are the same, only reversed. This applies to the spiral, *h' i'*, Fig. 14, and all the similar lines, as well as the spirals in Figs. 15, 16, 17, and 18. This, of course, reduces the labour vastly, and where time is short, it is a necessity to use this method. But for a beginner, I should advise drawing them all out by the construction lines for practice, and also to a bigger scale, with more divisions in the pitch and semicircle.

We now come to Fig. 16, which shows a single square-threaded screw of the same diameter as the preceding ones. Generally, the pitch of a square-threaded screw is double that of a V-thread of the same diameter. In this case I have, however, only taken it at $\frac{1}{4}$ of an inch, so that there will be more threads to draw, which will, I hope, be of some benefit to readers.

Set up the scale on A B, as usual, dividing the line into six equal parts, or $\frac{1}{4}$ of an inch each, equal to the pitch. Divide each of these again into eighths as before. Now, slightly to the right, set up two lines, *a a* and a^4 a^4, $1\frac{1}{2}$ in. apart, which is the outside diameter of the bolt. If we now return to Fig. 4 (p. 69), we shall see that the depth of a square-threaded screw is $\frac{1}{4}\frac{9}{0}$, or rather less than one-half the pitch. This, as stated, is $\frac{1}{4}$ of an inch, therefore, the half will be $\frac{1}{8}$ of an inch: so now draw two vertical lines, *b b* and b^4 b^4, within the first two, and distant from them a shade less than $\frac{1}{8}$ of an inch. These two lines will give us the body of the screw.

Draw two semicircles below the line A B—one equal to the outside diameter, the other to the body of the screw. Divide these as in the two preceding cases, and also the construction lines.

Now, as half the pitch is for the thread and half for the space, divide the lines *a a* and a^1 a^4, commencing on A B, into eighths of an inch. Take notice that on the left-hand side a thread is at the bottom, whilst on the right-hand there is a space; the reason has been explained in Fig. 14.

We will now proceed to draw the spiral line joining *c*, *d*, which points have already been obtained by projecting lines from $4\frac{1}{2}$ and 5 on the scale, to cut the lines *a a* and a^4 a^4 respectively. The points where the lines from $4\frac{5}{8}$, $4\frac{3}{4}$, and $4\frac{7}{8}$ cut, the vertical lines, a^1 a^1, a^2 a^2, and a^3 a^3, will give the intermediate points through which the spiral line joining *c* and *d* must pass. This can be drawn by hand, and at *d*, and any other similar places where the spiral can be seen turning upward or downward, there should be a small curve—or, I might say, there should not be an angle. The line should follow round in a short curve.

It will be seen that as the thread is always vertical to the centre line of the screw, the point *e*, where the spiral winds round the body of the screw, will be exactly opposite *d*—that is to say, where the line drawn from 5 on the scale to *d* cuts b^4 b^4 will give the point E, and the spiral drawn from it will gradually merge into the spiral *c d*, till at *f* it appears as the same line. To show this more clearly, take the lower thread; draw a line from 4 till it cuts b^4 b^4: this gives the point *g*; draw also from $3\frac{7}{8}$ to cut b^3 b^3, which it does in *h*; the line from $3\frac{3}{4}$ cuts a^2 a^2 in *i*—this latter point is the same as for the exterior spiral as well. This can now be drawn by hand. Now draw *k l* in the same manner as *g i*. Either in this way, or by means of a French curve, all the spirals can be drawn. I have shown the construction lines for the different spirals running at the back of the screw. No description will be necessary, I think.

Fig. 17 shows a double square-threaded screw of the same diameter as the last, the size of the thread being the same. The only difficulty is that the pitch is now double, and that a second thread now runs between the first one. The pitch, as will be seen, is from the bottom of one thread to the bottom of the next but one. I have shown the construction lines for each different curve, and lettered them as before, so I shall leave the reader to make it out for himself: which I think he will be well able to do by a careful study of the two preceding figures.

Fig. 18 shows the *section* of a nut to work on the screw, Fig. 17. This will, no doubt, strike the reader at first sight as looking rather peculiar: the threads here rising from the right to the left hand, instead of from the left to the right, as in the bolt; and this gives a deceptive appearance to it, and leads us to believe that it has been drawn wrong. The reason is that the nut being in section, the threads in it really fit the dotted threads, or those at the back of the bolt. These threads are drawn with the same pitch and construction lines as the last figure—in fact, with the exception of a new scale, the same construction lines produced serve for the nut as well as bolt.

Being double-threaded, the pitch is greater than in Fig. 16, so that the lines for obtaining the spirals corresponding to *e f*, *g i*, and *k l* in that figure come out more distinctly both in the nut and bolt. Another peculiarity is that in the nut the longer spirals now vanish behind, or merge into the shorter ones. I shall again draw the construction lines for the spirals, and leave them to explain themselves by the aid of a small amount of thought.

I may here state that a V-threaded nut will be obtained by the use of the same principles. From these last five figures, if well grasped, there will be no difficulty in fixing the points necessary for drawing the screws in Figs. 10, 11, 12, and 13 (p. 69).

I shall make no apology to my readers for the length of this paper, as I have intended it for beginners in machine drawing, who need a little more explanation than the more proficient ones; and I hope it will prove of some use to rising young mechanics.

It should, indeed, prove useful to all, whether workers in wood or workers in iron, to study papers of this kind, for the sake of the exposition of theory contained therein, which, when duly comprehended, cannot fail to be helpful in actual practical work.

TOY BALLOONS: HOW TO MAKE THEM.

BY T. S.

PREPARATION OF MODEL—CUTTING GORES—JOINING GORES—WIRE HOOP AND LOOP—SUSPENSION OF SPONGE CHARGED WITH SPIRIT—STARTING BALLOON.

I HAVE had considerable experience in the construction of fire balloons, but none in gas balloons, but with the instructions in Vol. II., page 762, there should be no difficulty in making gas balloons also.

Obtain twelve sheets of common tissue-paper, any colour; but I find that the sizes differ, and allowance should be made for this. Cut a sheet of plain paper the same size as the tissue, and commence by drawing a pattern or model. Draw a circle, as shown in Fig. 1, 12 in. in diameter; divide it vertically by a straight line, and at the lower end set off 2 in. each side, and join by curved lines to your taste. Divide the semicircle on one side of the model into any number of equal parts, as shown in Fig. 1, and

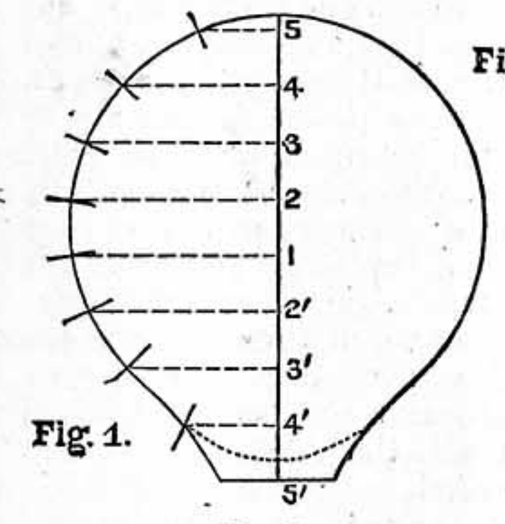


Fig. 1.

Fig. 3.

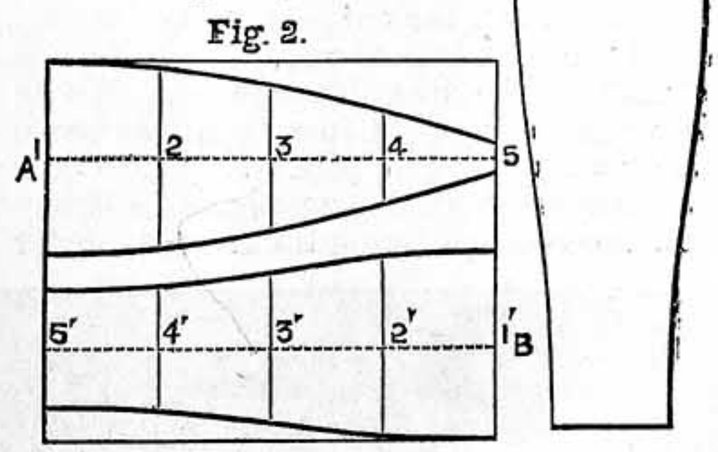


Fig. 2.

Fig. 1.—Pattern or Model for Toy Balloon. Fig. 2.—Gore set out in Two Parts on Tissue Paper. Fig. 3.—Parts cut out and joined to form Gore.

from each point of division draw horizontal lines or ordinates at right angles to the vertical line, and number them, as indicated in the diagram. Next take a sheet of plain paper, and draw a line 6 in. from each edge, shown in Fig. 2 by dotted lines, A, B. These will be the centre lines of each of twelve gores. Take the centre ordinate, No. 1, as an equator, and set the distance on each side of the dotted lines at A and B. Set off along A and B as many parts as there are ordinates, draw lines 1, 2, 3, etc., and set off the ordinates on each side as shown. Cut out at these points, and you will have a pattern gore in two pieces of the largest size that will cut out of a sheet of tissue paper, and will make a balloon 12 ft. round the equator, and about 4 ft. high. You will notice that the ordinates, 5 and 5', should be set off on the edges of the paper, the larger one, 5', being the mouth of the balloon, which should be about 16 in. diameter. The top, 5, is left, so as to make a hole in the finished balloon about 6 in. diameter, to be covered with a circular piece of paper when all the other joins are dry. Having cut out the pattern, lay it on the twelve sheets of paper, and carefully cut round through the lot with a strong sharp pair of

scissors. Some weights are to be placed on the paper to keep all in place while cutting, and the whole moved about so as to cut without any disturbing the paper.

To join the gores together, take them in pairs, and lay the upper one carefully smooth, and place the lower part on it, so that the under part projects ¼ in. beyond; then another upper part and another lower part, each ¼ in. lap, and so on, until all the twenty-four pieces are laid out. Be very careful that the centre lines are over each other, or the gore will not be straight. Now, after placing on some weights, paste gum or thin glue over all the ¼ in. laps, and at once turn over each on its proper part, and the twelve joints will be made. Dab down with a cloth to ensure a close joint, and before drying open out each, and let it dry open, hanging on a line. You will now have twelve well-shaped gores, as in Fig. 3, which, when dry, should be laid in pairs, and joined together as before, taking care what you do join. Having finished five joins on one side, turn over, and do six on the other. Open out as soon as possible, or the paste will make a double joint by soaking through the paper to the next sheet; and make the final joint in the same manner by folding back the inner sheets until the top and bottom sheets only are left. You will find some lead or other heavy weights very useful to keep all in place. Be careful to keep the equators opposite each other; never mind the top and bottom. When dry, open carefully out. Cut out a circular piece to close the top opening. Pass a circular flat tray or small work-table into the mouth of balloon (I have used a dinner plate), and after carefully spreading out, close the top opening.

Obtain some common iron wire, rather thicker than a common pin, measure the opening or mouth, and make a neat hoop same size, with neatly twisted join; pass it into the mouth, and turn up the edge over the wire ½ in.; paste, and dry. Take another piece of wire, about 1 in. or so longer than the diameter of mouth, form a loop in centre, and hook the looped wire on to the hoop at each side, of course selecting opposite gores to fix the hook to. This will carry the fire, which should be a piece of sponge of the size of an egg when dry. Lightly twist a piece of wire round it with a hook as close as possible, so that, when hooked into the loop across the mouth, it will hang close to it. To send the balloon up, select a situation against a building out of the wind. Avoid *trees*, *wood buildings*, and *thatched roofs*. Put your sponge to soak in some methylated spirit of wine. Have ready some torches made of loosely twisted newspaper. Get someone to hold out the balloon, and having lighted the torch, carefully pass it up into the balloon, which will soon expand and try to rise. Someone should now hook on the wet sponge, and with a little care the torch should be withdrawn and the sponge lighted at the same time. Do not be in too great a hurry to let go, but hold it by the edge of the mouth, and when it seems inclined to rise, let go with a twist, so that it spins as it rises, and does not swing about. I have successfully let off scores, no matter how the wind blew. Of course, you can have coloured gores, and can colour your fire to taste.

These balloons give great pleasure, and cost nothing but a few hours' work; but at the shops a balloon of the kind described above would cost from 3s. 6d. to 5s., which is a long price to pay for an article of this sort.

APPLIANCES FOR WORK TO BE MADE BY THE WORKER.

BY B. A. BAXTER.

GUIDES FOR MITRE-BOX—GUIDES FOR GROOVING AND STEP LADDER MAKING—MITRES FOR NEWEL CAPS—CUTTING LENGTHS FOR BOXES—SAWING DOVETAILS—BENCH HOOK—STOPS ON SHOOTING-BOARD—"DONKEY'S EAR"—OCTAGON STRIPS—SASH BARS—WOODEN COGS.

RECENTLY I advised the amateur to imitate the professional in making appliances to aid him in his work, on the ground that it would improve his work and add to his resourcefulness. The workman who, above all else, seeks to do his work with the least trouble to himself; the manufacturer (who does not generally make with his *own* hands) who desires the greatest output; and the amateur, who requires every aid that he can obtain in order to surmount the difficulties of unaccustomed operations—all alike can make profitable use of any helps that are suggested or provided.

Only mechanical purists can object to these helps; and as such people are few, and probably will not read this little article, I shall ignore them, and proceed.

In order to preserve something like order, we will discuss appliances for sawing, planing, chiselling, and boring, in the order I have placed them.

Everyone knows the difficulty of sawing—that is, everyone who has tried to use a saw knows, first, that it is difficult to make the tool cut, and when that is accomplished, that it is not at all easy to cut *accurately*.

The most widely known appliance to assist in accurate sawing is, perhaps, the mitre-box (Fig. 1), used for cutting mouldings, picture framing, etc., to the proper angle. I shall not describe it, as a drawing has already appeared in WORK; but would only say that its usefulness can often be increased by making it longer, and having a stop fixed on it to gauge the length of the moulding to be cut; and also that square cuts, as well as at other angles than 45°, can be made with its assistance. If several pieces are to be cut to similar size, it is profitable to make a rough appliance of this kind.

Further, if a hexagon card-tray in fretwork is to be put together, it is less trouble to make a cut at the angle of 60°, and then fix a strip on the board (Fig. 2) corresponding to the elevation angle of the sides, than to find the angle and set bevels, and mark and cut in the most careful and scientific manner.

In grooving across thin boards for partitions, beginners often find a difficulty in sawing truly. If a strip of thin wood, having its edge straight and square, is laid upon the work exactly to the line, and the left hand placed firmly upon it, a great help is at once obtained in cutting for the grooves. The saw will work close to the strip, and no fear of the saw wandering from the line causes a nervous indecision in the worker. Immediately the saw has made for itself a path, the strip may be removed.

A similar assistance can be obtained in making step ladders, or anything in which a repetition of the same distance is required. (Fig. 3.) A piece of wood cut to the correct length and angle has on its edge a stop, whereby it may be held, always at the proper angle, on the material. It becomes then, in effect, a gauge, a bevel, and a set-square combined. (Fig. 4.)

In making such articles as seats for lecture-rooms, etc., gauges for the recesses, mortises, curves, and scribings can easily be cut in sheet zinc, and right and left ends can be marked with equal facility by simply turning the pattern. (Fig. 5.) This, of course, applies not only to sawing, but also to other operations.

There is also a contrivance for sawing mitres in newel caps, which I will try to explain. It is obvious, on consideration, that any straight line drawn from the circumference of a circle towards the centre must be either a radius or parallel to a radius of the circle; and if some contrivance can be made to ensure the right width and proper angle—especially keeping the opposite angles the same—we can make a useful help for cutting mitres to newel caps. (Fig. 6.)

If, therefore, a centre line is drawn on a piece of wood, upon which line the centre of the turned cap is applied and fixed, two saw cuts, equally distant and parallel to the centre line, will give guidance to the saw in cutting the V-cut for the insertion of the handrail.

A very simple help towards cutting off lengths for boxes, trays, or similar small work of which a number are required, consists merely of a piece of wood a trifle longer than the length of the pieces required, and on the under side fix a stop. Then, by placing the gauge on the work, neither square, rule, or pencil is required to cut off many pieces of uniform length. (Fig. 7.) This has been very useful to the writer of this in making partitions for what are termed pigeon-holes, and the plan is also capable of being used as an assistance in planing. (See also Fig. 8.)

For sawing dovetails so that they have the uniformity that adds so much to the appearance of the work, there is an easily-made appliance. All that is required is a small piece of wood rebated at the end, and the dovetail saw used to make a model dovetail in the reduced thickness, care being taken to preserve similar angles; or the dovetails may be uniform in size, but the pins will look misshapen. (Figs. 9, 10.)

For the circular saw many dodges are used, but they mostly resolve themselves into templates of various forms (Figs. 11, 12), and can be divided into appliances for cutting at various angles on plan, as picture-frames or elevation, as cutting strips of a wedge-shaped section, such as bottom sticks for roller blinds, and cutting off arrisses from pieces of square section, such as octagon blind-rollers. This last, however, needs a trough rather than a template, and will be mentioned among the appliances for planing which follow this (similar to Fig. 21). The appliance for cutting dovetails on a circular saw by the Britannia Company is a clever instance of the same simple expedient, which many have used in part, though not, perhaps, so fully. There is also a well-known contrivance called a bench hook. This, sketched in Fig. 13, is very useful in sawing small work, shoulders of tenons, etc. If made about 11 in. or 12 in. long, it may be used instead of a shooting-board; and for holding wood under the operation of chiselling it is of value. Its great use is, however, for cutting shoulders to tenons, forming an excellent stop, and greatly aiding the worker.

For planing, the great assistance of home-made contrivances is obvious in the number which exist, and which, perhaps, we may, as the result of this article, increase.

The ordinary shooting-board is exceedingly useful for planing edges of boards too thin or flexible to treat in the bench screw; but it is too well known to need a lengthy description. There are, however, additions to the ordinary shooting-board which will

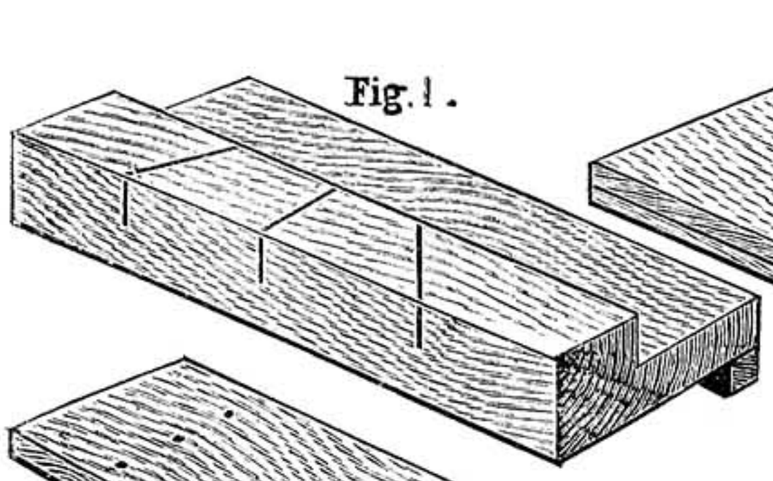


Fig. 1.

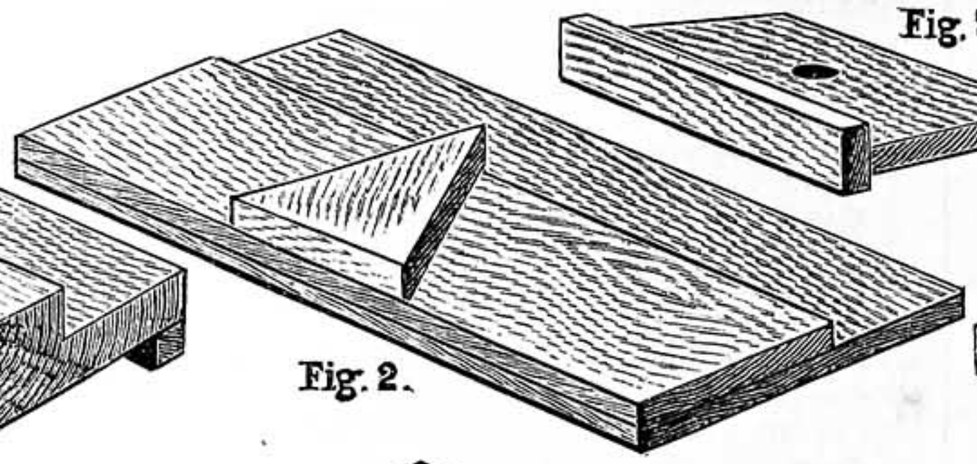


Fig. 2.

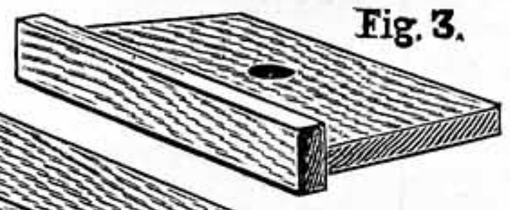


Fig. 3.

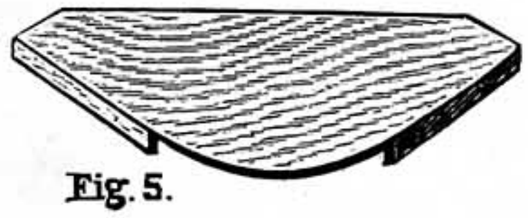


Fig. 5.

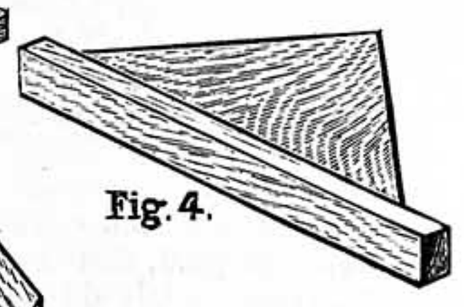


Fig. 4.

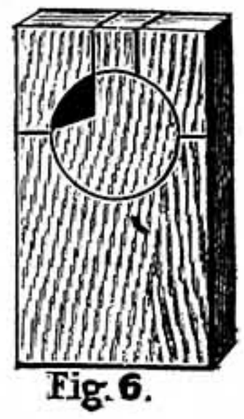


Fig. 6.

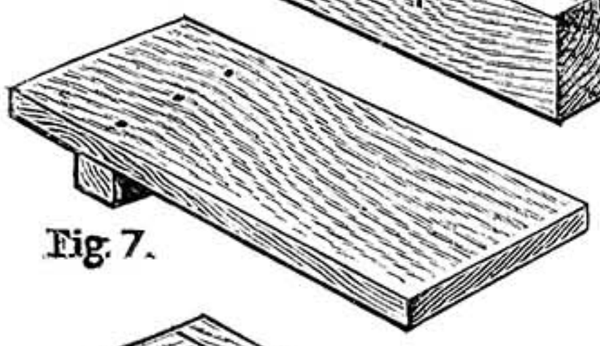


Fig. 7.

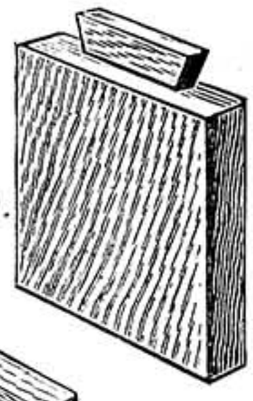
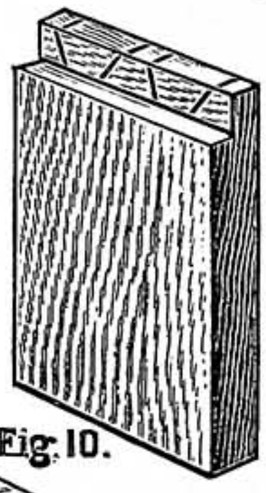


Fig. 9.



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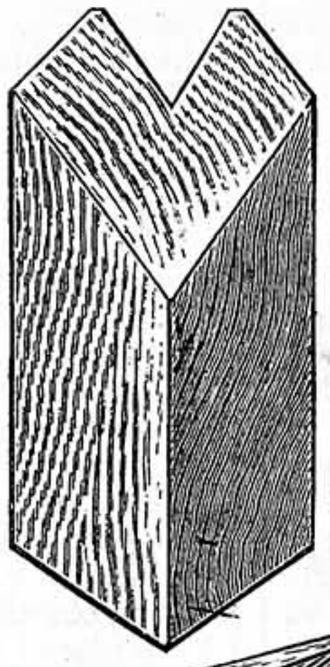


Fig. 11.

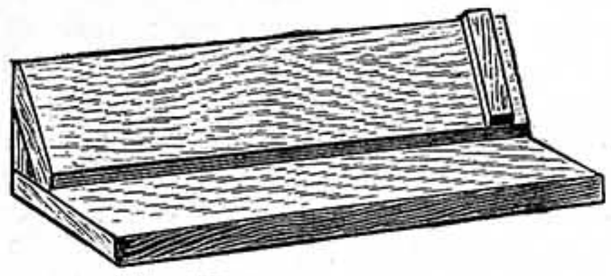


Fig. 17.

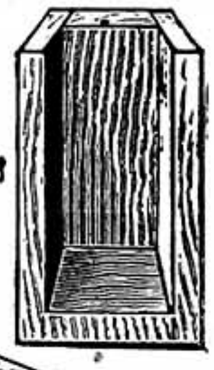


Fig. 18

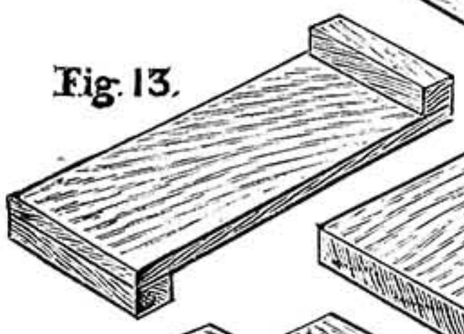


Fig. 13.

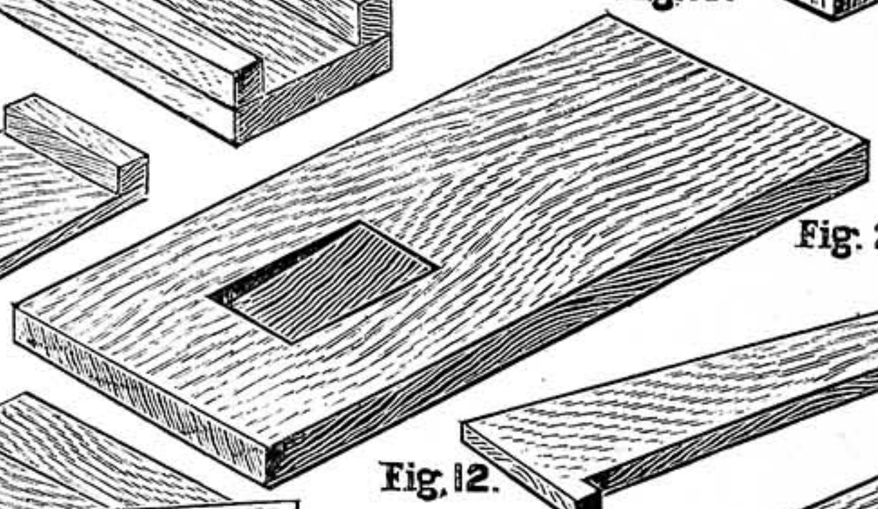
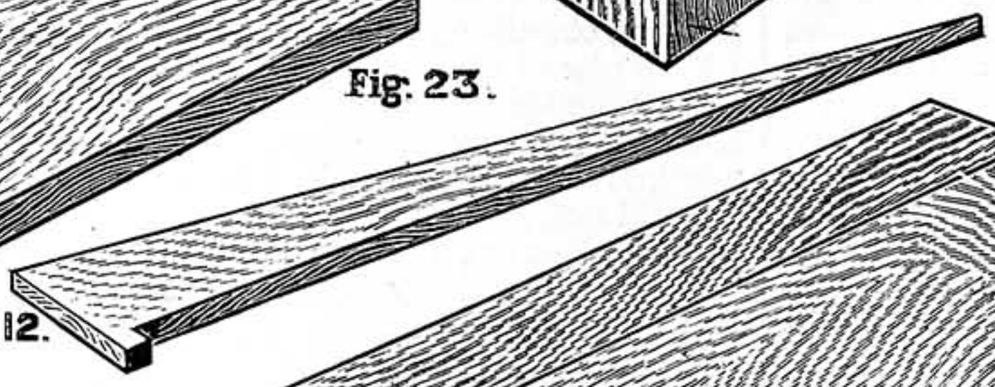


Fig. 23.



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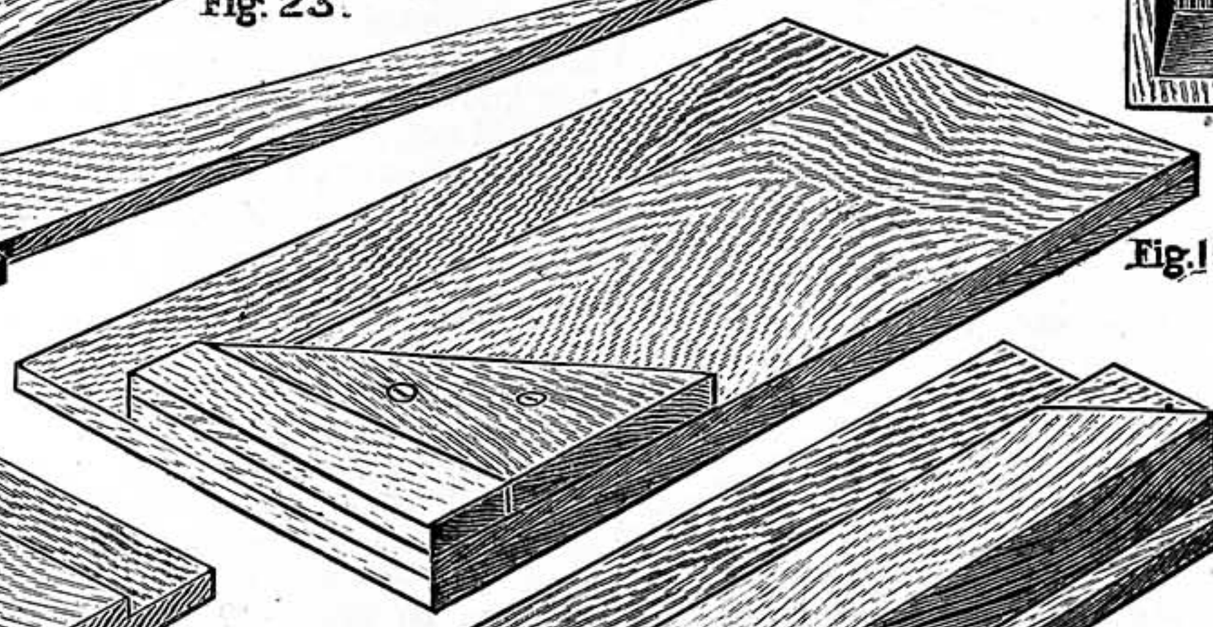


Fig. 16.

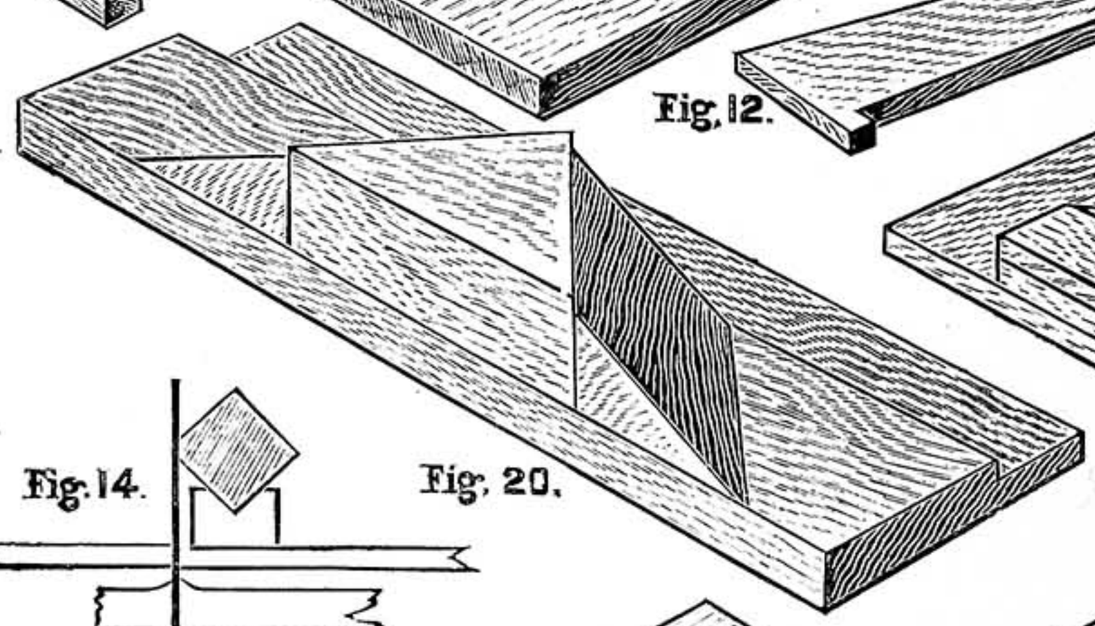


Fig. 20.

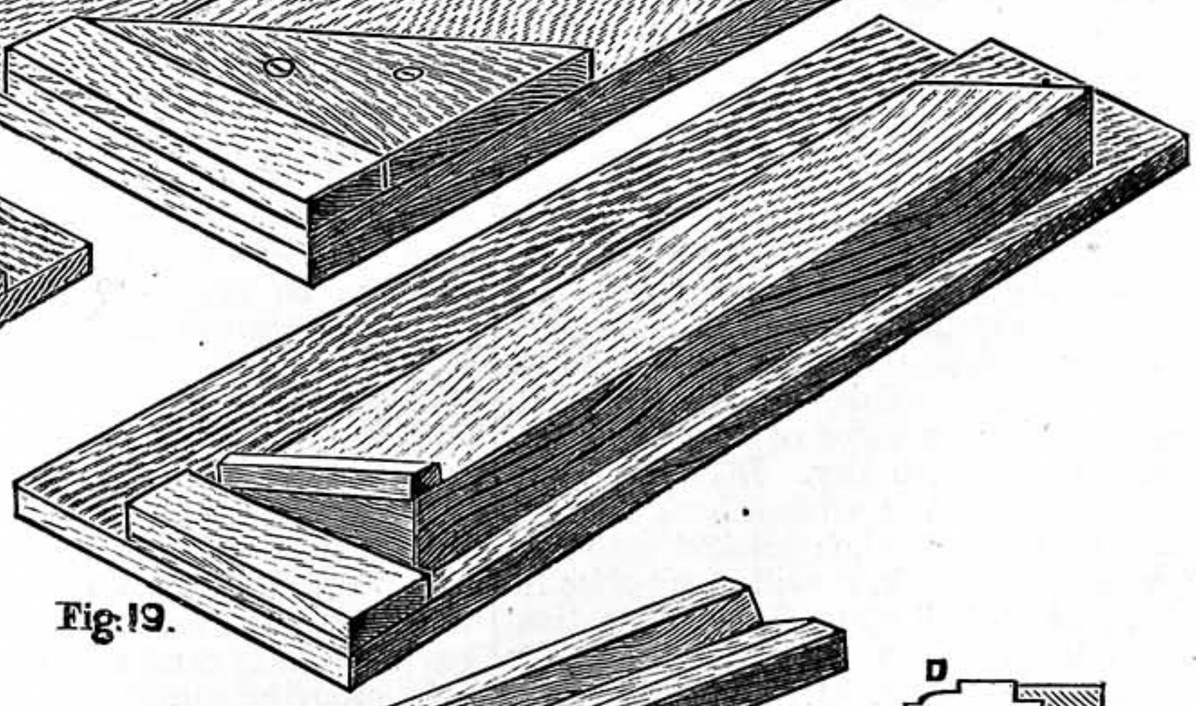


Fig. 19.

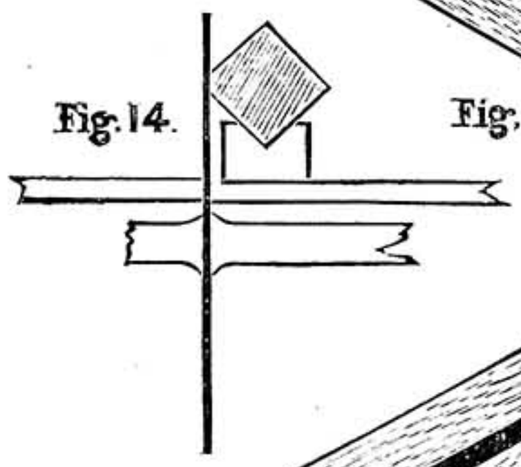


Fig. 14.

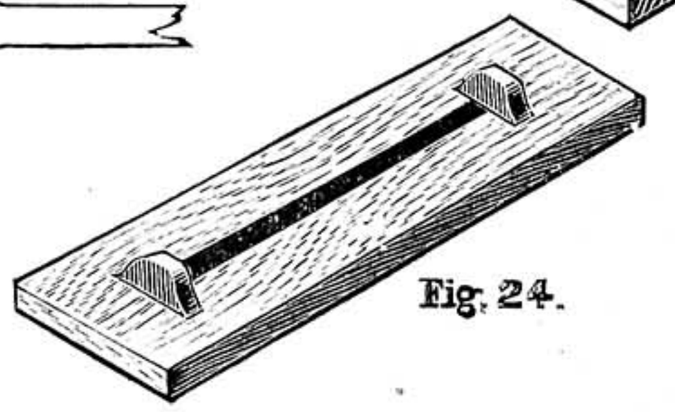


Fig. 24.

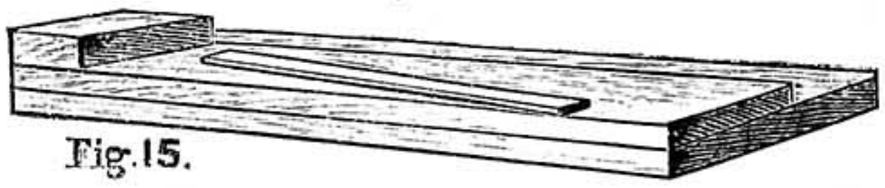


Fig. 15.

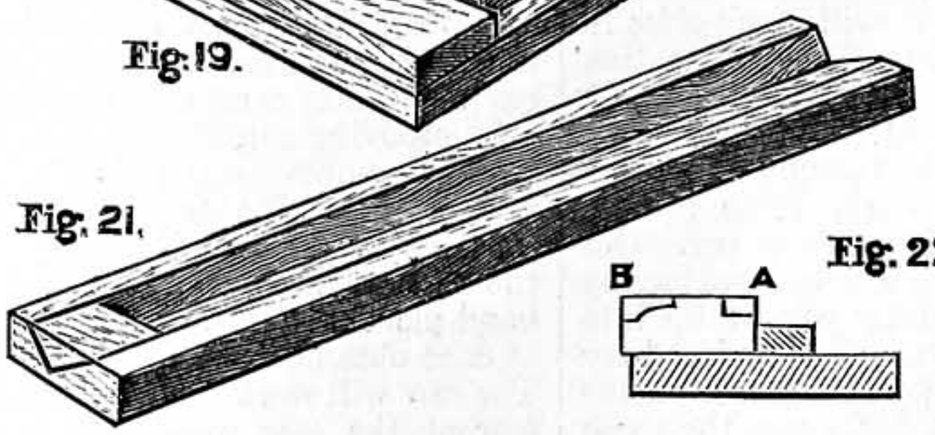


Fig. 21.

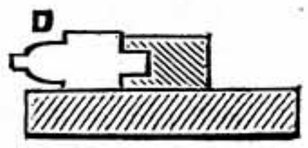


Fig. 22.

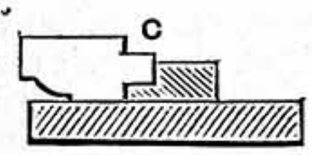


Fig. 1.—Mitre cut for sawing Mitres. Fig. 2.—Mitre for Hexagon. Fig. 3.—Gauge for Step Making. Fig. 4.—Pitch Board, also applicable to Circular Sawing. Fig. 5.—Gauge for Corners. Fig. 6.—Contrivance for cutting Mitres in Newel Caps. Fig. 7.—Gauge for rebating a Dado Groove or cutting off Stuff. Fig. 8.—Trough to cut to a Length. Figs. 9, 10.—Models for making Dovetails uniformly. Fig. 11.—Template for Stop Chamfer. Fig. 12.—Template for Circular Saw, suitable for tapering Legs. Fig. 13.—Bench Hook for Sawing. Fig. 14.—Trough for Circular Sawing. Fig. 15.—Shooting-Board with Taper Attachment. Fig. 16.—Shooting-Board altered for Occasional Use. Fig. 17.—Mitre-Board for Partitions of Trays, etc., "Donkey's Ear." Fig. 18.—Upright Trough for planing to a Length, front removed. Fig. 19.—Shooting-Board with Movable Angle Strip for Pedestals. Fig. 20.—Mitre-Board with Angle Blocks. Fig. 21.—Trough for Rollers, suitable, with slight alterations, for Circular Sawing or Planing. Fig. 22.—Sticking-Board for Sash Bars with Strips: begin by making Rebate A, then Moulding B, then Rebate C, and finish with Moulding D. Fig. 23.—Board for Wedges. Fig. 24.—Template for Wheel Cogs.

add to its usefulness for special purposes. Of these, a temporary stop, fixed parallel to the edge traversed by the plane, is the simplest. This will be found of great assistance in planing a number of pieces of wood to uniform width. After the required number have been prepared, the stop can be removed from the board. Another addition, useful at times, resembles the parallel ruler, with this exception—that it is for securing a uniform taper to the pieces of wood in course of preparation. There is also the adjustable stop to make angles other than 90°, which ought to be mentioned. If the centre on which the stop turns is as near the corner of the stop as possible, the work will be facilitated, and the usefulness of the shooting-board be less hindered. A wing nut and bolt working in a slot would fix the whole to the desired angle; or a movable piece might be fixed on the shooting-board, as Fig. 19 suggests.

Leaving the shooting-board for mitres of picture-frames and cabinet-work out of the

question, as being universally known to the readers of WORK, there are modifications which may not be so familiar. There is the mitre-board, commonly called the "donkey's ear," which is used for mitred partitions and small mitred boxes (see Fig. 17); there is also the trough-like box which so materially helps plane makers to get bead and rebate planes so square at the ends and uniform in length; modifications of the shooting-board for making pedestals for statues or for loo tables, or such purposes as require angles other than right angles to be made with ease and uniformity. This, of course, may be only an attachment to the ordinary shooting-board. In a similar way, an addition to the ordinary mitre-board will enable the worker to mitre bevelled picture-frame linings, which would, to some pictures, form a pleasing change to the flat gilt mount so often seen.

Then for the purpose of making octagon strips from square lengths of wood, preparatory sometimes to rounding them, a help may be afforded by an appliance made by cutting down a square strip diagonally, and fixing the two strips made thereby on a flat piece of wood. Any suitable stop will then hold a strip in the right position for planing off the angles. (See Fig. 21.)

The preparation of sash bars (Fig. 22) almost necessitates some appliance to hold the piece of wood while being converted into a sash bar.

The rebates should first be made, to do which with ease, a board, having at a convenient distance a strip to resist the pressure of the sash fillister, a few steel points driven into the board, leaving about $\frac{1}{8}$ in. standing out and pointed, so placed that they will stick into the bar where the other rebate will remove the marks, will do for the first rebate, A. For the rebate on the other side, it needs a piece of wood, as in C, equal in thickness to that which has been planed away, to support the bar while the second rebate is being made; and for moulding the bar, a piece of wood equal in thickness to the bar, and having a groove into which the rebated bar can now fit, as in D, will be found most convenient. It will seem simple to some to point out that anyone who wants to make some wedges of uniform size can find much assistance by making a suitable mortise in a piece of hard wood, deepening one end as required, and plane the wedges while they rest in such a receptacle, as in Fig. 23.

Pattern-makers can shape wooden cogs to affix to their wheel patterns by planing to the outline of a template at each end of the strip. (Fig. 24.) The same agreement of outline in brackets or other shaped work can be obtained by sawing and shaping several together on the same principle.

Fig. 17.

Fig. 18.

Fig. 23.

Fig. 24

Fig. 19

Fig. 15.

Fig. 20.

Fig. 16.

Fig. 21.

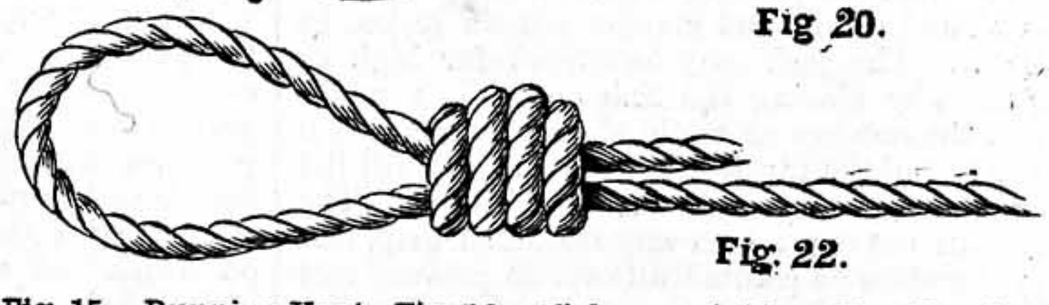


Fig. 22.

Fig. 15.—Running Knot. Fig. 16.—Fisherman's Eye. Fig. 17.—Openhand Eye. Fig. 18.—Flemish Eye. Fig. 19.—Crabber's Eye. Fig. 20.—Bowline. Fig. 21.—Running Bowline on Bight. Fig. 22.—Hangman's Knot. Fig. 23.—Running Knot with Two Ends. Fig. 24.—Ditto fastened.

KNOTTING, SPLICING, AND WORKING CORDAGE.

BY LANCELOT L. HASLOPE.

EYE KNOTS.

RUNNING KNOT OR SLIP KNOT—FISHERMAN'S EYE—OPENHAND EYE—FLEMISH EYE—CRABBER'S EYE—BOWLINE KNOT—RUNNING BOWLINE ON A BIGHT—HANGMAN'S KNOT—RUNNING KNOT WITH TWO ENDS—RUNNING KNOT WITH TWO ENDS FASTENED.

ONE of the simplest of these is shown in Fig. 15. It is the "Running" or "Slip Knot." A bight is first formed, and an overhand knot made with the ends round the standing part. The standing part may be drawn through the knot, and the eye made to any size required. There is less chance of the knot coming undone if an overhand knot is made on the end A. This is the knot with which a sailor ties his neck-handkerchief, and it is therefore sometimes called a sailor's knot.

Fig. 16 is the "Fisherman's Eye Knot." A bight is first made of sufficient length, and an overhand knot formed with the standing part round the other strand; the end is now passed round the standing part, and knotted as before. We now have a running knot A, with a check knot B, which, when hauled upon, jam tight against one another, and hold securely. This is one of the best knots I know of for making an eye in fishing, as the strain is equally divided between the two knots. Fig. 17 shows a very common way of making an eye on the end of a piece of cord—indeed, you will often find those who know no other mode of doing so. It is practically the same knot as Fig. 8, only, instead of being made with two ropes, one only is used. The end is brought back along the rope to form the eye, and an overhand knot made with the two parts. This knot, from being so easily made, is often used, but as it lacks strength, like the openhand knot (Fig. 8), it is not advisable to use it where it is required to bear much strain. My readers will by this time doubtless have noticed how very often openhand knots come into requisition as component parts of other knots.

Fig. 18 is an eye made with a "Flemish" knot. It is worked just the same as a single Flemish knot, the only difference being that two parts are used instead of one. It is stronger, but clumsier, than the one just described. It is not very often used.

The "Crabber's Knot" (Fig. 19) is a curious and not very well-known knot. I learnt it one day coming home from fishing in a friend's yacht. His captain was an old crabber, and we had been discussing the best form of eye knot for fishing gear, when he recommended me this one as being very secure, and less likely to part at the knot when a strain was put on it, than any knot he knew. To make it, bring the end back to form a loop, taking it first under and then over the standing part, up through the main loop, over the standing part again, and up through its own bight. Before the turns are hauled into their places, the knot will slip on the part A, as in an ordinary slip knot; but if the part B is hauled upon, the strand A, which passes through the centre of the knot, rises, and the coil which goes round it jams, making the knot secure: so that it may be used as a running knot or otherwise, as desired. This is also called a running knot with crossed ends.

Fig. 20—the "Bowline Knot"—is one of the most useful knots we have. It is impossible for it to slip, and it is therefore always used for a man to sit in when he is slung, for the purpose of doing some particular piece of work. The end is first laid back over the standing part, so as to form a

loop; the end is then passed up through the loop, round the back of the standing part, and down through the loop again. Hauling on the end and the standing part makes the knot taut.

Fig. 21 is a modification of this knot, called a "Bowline on a Bight." The loop is made as in the previous knot, only with the two parts of a doubled rope; the bight is then passed up through the loop, opened, and turned backwards over the rest of the knot, when it appears as in the figure. To untie it, draw the bight of the rope up until it is slack enough, and bring the whole of the other parts of the knot up through it, when it will readily come adrift. If the standing parts of the rope are held fast, it puzzles the uninitiated to undo it. I remember hearing of a mischievous person who used to amuse himself by going round to the country inns, and making this knot on the bridles of any farmers' horses he could find tied up outside; the result being that the old farmer, whose wits probably were not sharpened by his recent potations, had generally to cut the reins before he could get them over his horse's head. A "Running Bowline" has the knot made on the end after it has been passed round the standing part, thus forming a loop through which the main rope will run. Two ropes may be joined together by making a bowline in the end of one of them, and putting the end of the other through the bight, and forming with it another bowline on its own part. This is often used to join hawsers together.

Fig. 22 is the "Hangman's Knot." A bight is first formed in a rope, which is held in the left hand; the end is then coiled several times backwards—that is, from right to left round the standing part—and then passed forwards through the coils. It is made more easily if, in the case of small stuff, the first finger of the left hand be laid along the standing part, and the coils made round them both. This keeps the coils open, so that the end passes through them readily. In the case of larger cordage, a piece of stick may be used. The advantages of this knot for its particular purpose are that when well greased it runs very readily, and that, from its large size, it presses on the veins of the neck, and thus extinguishes life more rapidly than a smaller knot would do. I believe our modern executioners instead of this knot use a thimble—that is, a grooved ring of metal spliced into the end of a rope, and the main part passed through it to form the fatal noose.

Fig. 23 shows a method of making a rope fast to a post or pillar. The rope is doubled and passed round the post, and the ends put through the loop. If it is required to make this fastening secure, the ends may be passed round the standing part and through the bight thus formed, as in Fig. 24; or, instead of passing the cords through the bight, a loop may be formed by doubling the ends, and this loop put through the bight, thus forming a slippery hitch. This knot has the advantage of being more readily undone than the other one, as we have only to pull at the ends, and the rope is released at once. We may also secure the ends by making a Flemish knot on them, instead of an overhand knot.

This brings us to an end of the consideration of the various knots that are in use, classified as simple knots, knots for joining ropes, and eye knots. In my next paper I shall endeavour, by means of description and illustration, to make the reader acquainted with the modes of making hitches and bends.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

17.—Pope's Improved Carriage Jack.

In Fig. 1 an illustration is given of the "Improved Carriage Jack" recently introduced by Messrs. W. Pope & Co., Engineers, etc., Barley Fields Iron Works, St. Philip's, Bristol, and manufactured by them in two sizes, sold respectively at 12s. 6d. and 15s. 6d. each, the smaller size being sufficiently high for all ordinary carts and carriages, from very low phaetons to the ordinary dog-cart, and the larger size intended to meet the requirements of axles of very high carriages and dog-carts and breaks that are equally high. The working is very simple. The jack is merely placed under the axle, and the handle A is lowered to the position A′, as shown by the dotted lines; the plunger B then rises to the position B′, and handle and plunger remain locked in position. The jack may be altered for high or low axles by placing the link or bridle C under one of the notches or teeth, shown in the part D to the left of the illustration. Both sizes will lift carriages up to a weight of about 30 cwt. The jack does not depend on any frictional grip, and may therefore be painted all over to prevent rust and corrosion. It is made entirely of good malleable iron, and consequently is not liable to get broken through a fall or any other accident. The head is capped with wood to prevent damage to the paint of carriage axles, etc. The advantages of the Improved Carriage Jack are automatic locking when up, extreme lightness and strength, cheapness, and capability of being carried conveniently in the boot of a carriage for immediate use in case of need or accident.

Fig. 1.

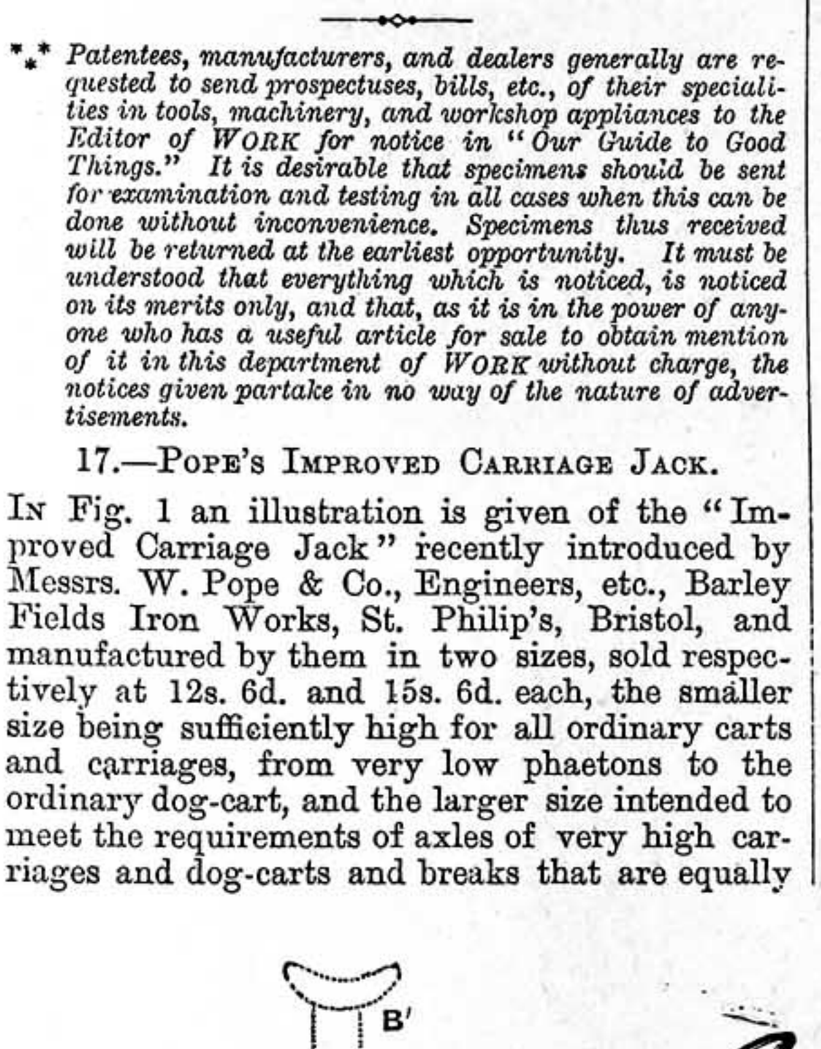


Fig. 2.

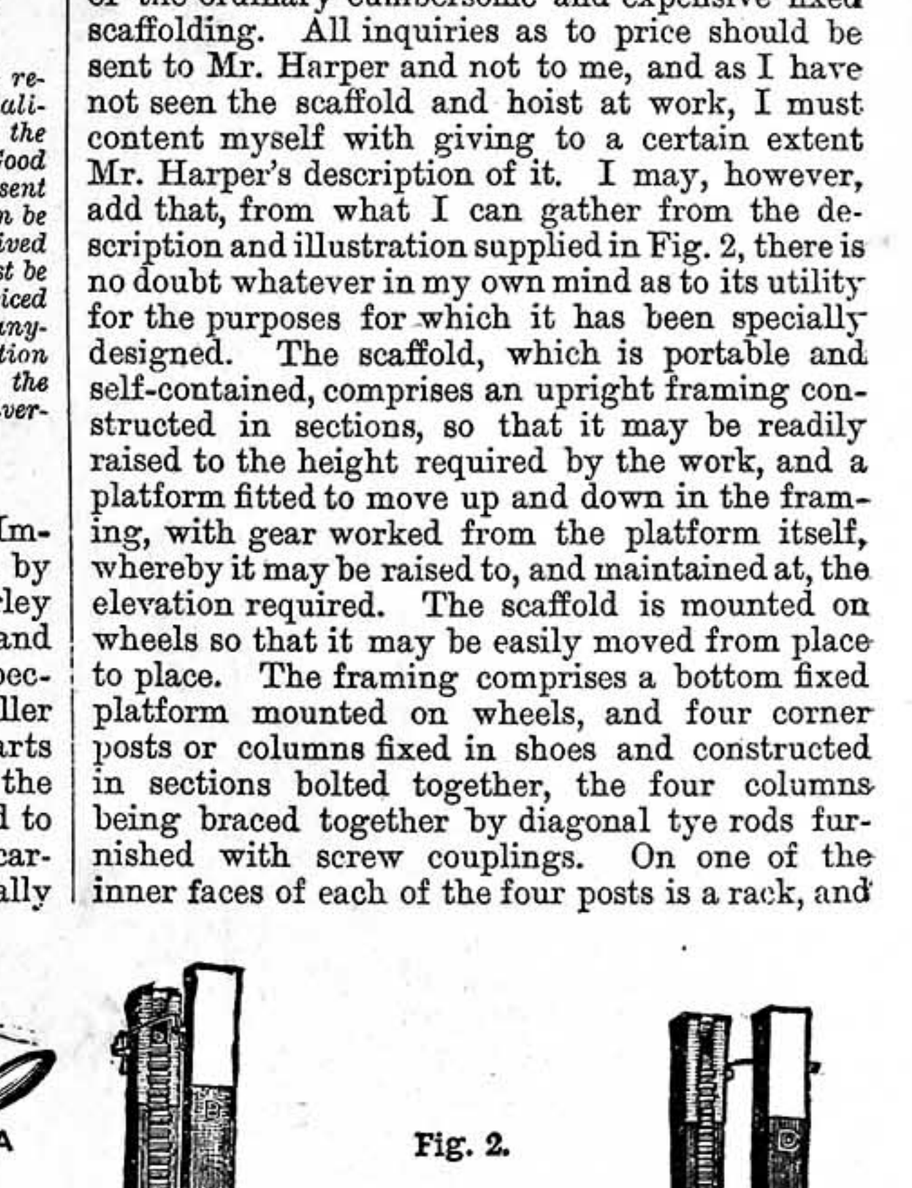


Fig. 1.—Pope's Improved Carriage Jack.
Fig. 2.—Harper's Patent Scaffold and Hoist.

18.—Harper's Patent Scaffold and Hoist.

The Patent Scaffold and Hoist, invented and made to suit any requirement by the patentee, Mr. J. Harper, 129, King's Road, Camden Town, London, N.W., can be used for every description of building and decorative work, internal or external, as well as for building purposes, instead of the ordinary cumbersome and expensive fixed scaffolding. All inquiries as to price should be sent to Mr. Harper and not to me, and as I have not seen the scaffold and hoist at work, I must content myself with giving to a certain extent Mr. Harper's description of it. I may, however, add that, from what I can gather from the description and illustration supplied in Fig. 2, there is no doubt whatever in my own mind as to its utility for the purposes for which it has been specially designed. The scaffold, which is portable and self-contained, comprises an upright framing constructed in sections, so that it may be readily raised to the height required by the work, and a platform fitted to move up and down in the framing, with gear worked from the platform itself, whereby it may be raised to, and maintained at, the elevation required. The scaffold is mounted on wheels so that it may be easily moved from place to place. The framing comprises a bottom fixed platform mounted on wheels, and four corner posts or columns fixed in shoes and constructed in sections bolted together, the four columns being braced together by diagonal tye rods furnished with screw couplings. On one of the inner faces of each of the four posts is a rack, and with these racks are gear-pinions on a pair of shafts mounted beneath the rising platform, these shafts being geared with a worm gear common to both and operated through bevel gear from a winch handle mounted at convenient height above the platform. On the other inner face of each corner post is a guide of dovetail or T-section, with which engages a shoe on the end of the platform whereby all outward defection of the corner post is prevented and the wheels are held in gear with the racks. The travelling wheels on which the apparatus is mounted have peripheral holes in which engage locking bolts mounted beneath the base platform and coupled to a common lock shaft operated by a lever for the purpose of holding the scaffold stationary when in use. The whole apparatus can be put up or taken to pieces in a short space of time by any ordinary workman, who cannot make any mistake in the work, every section being marked as shown in Fig. 2. The advantages possessed by the Patent Scaffold and Hoist over the old system of scaffolding are numerous. Firstly, no ropes, poles, putlogs, ladders, or scaffolders are required. Secondly, it is far more useful for interior work than the old scaffolding, which cannot be removed until the work is completed, a matter attended with much inconvenience in large places of business in which cleansing, repairs, decoration, electric lighting, etc., are chiefly done in the night, and the patent scaffold can be

quickly put up at nightfall and as quickly removed in the morning. Thirdly, the workmen employed can put the material required into the cradle and wind themselves up to the height required when at work, thereby saving time and labour. Fourthly, it is perfectly safe, and cannot by any means work down unless worked by the men in the cradle; further, being self-contained it can be stopped at any point, and affords sure safeguards against accidents that often arise from the use of temporary scaffolding composed of planks, ladders, etc. Lastly, for electric lighting it is specially valuable, as the wire and wood casing can be conveyed to the height at which they are to be fixed, carrying the wire-runner and carpenter so that they can complete their work as they run along. THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTER FROM A CORRESPONDENT.

Saw Buckling.—W. H. R. (*London, N.W.*) writes:—"Having seen in No. 106, Vol. III. of WORK, a method of trueing buckled circular saw, I send you another method, often used in saw mills. When the saw begins to run wild, take the piece of wood you were sawing off the bench, and let the saw run; and while it is warm, get a mug of cold water and let it run on the saw, and it will very soon run true again."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

WORK Advertising and Addresses.—We cannot give our contributors' addresses, but will attend to any stamped, directed letter. The rates for advertisements in WORK have been printed in every issue since No. 1 of the Magazine.

Model Electric Lights.—W.E.B.(*Birmingham*).—The articles on "Model Electric Lights" were published in WORK, No. 76, August 30; No. 82, October 11; No. 89, November 29; No. 92, December 20, 1890; No. 94, January 3; No. 97, January 24; No. 99, February 7; No. 101, February 21; and No. 104, March 14, 1891: nine numbers in all, forming part of Vol. II. All back numbers are in print.—G. E. B.

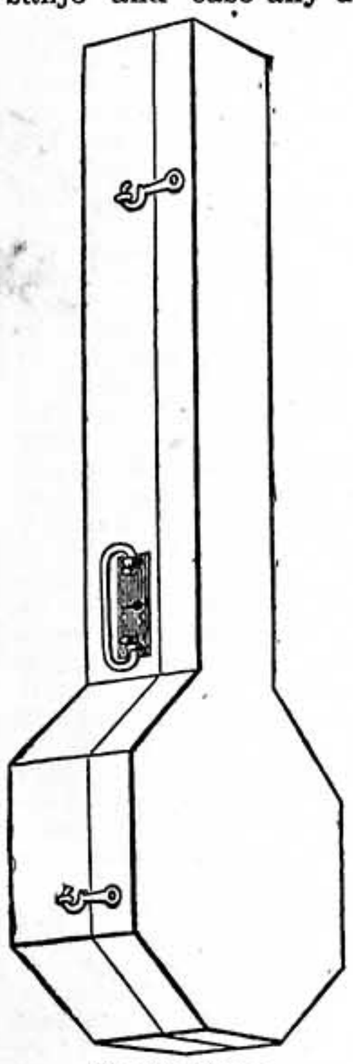
Battery Zincs.—SELF HELPER.—Battery zincs always work better when amalgamated, but it is not absolutely necessary to have them amalgamated for use in the Bennett caustic potash cell, since there is no waste of zinc when the circuit is open. Dilute acid cannot be employed in this cell, as the acid would dissolve the iron borings and the tinned iron sides of the cell.—G. E. B.

Glass Working.—SELF HELPER.—I do not know of a book at the price of 3s. 6d. There are two chapters on the manipulation of glass for laboratory purposes in "Practical Chemistry," Vol. I., by Harcourt and Modan; price 7s. 6d. The lessons are illustrated with sketches of the apparatus, and method of making them.—G. E. B.

Cost of Electric Light.—A. T. (*Hampton Wick*).—It is not advisable to have an electric light installation of only one 25 c.p. lamp, and one dynamo to light it, as the arrangement would involve a waste of power and material all around. If you must have a light of 25 c.p., get five 5 c.p. lamps, or two 10 c.p. and one 5 c.p. lamps, and divide the current between them. It would be even better to get either three 10 c.p. lamps or four 8 c.p. lamps. The lamps will cost you, at retail price, 5s. each, and holders for each from 1s. to 2s., according to quality. The dynamo will cost from £4 to £5 if bought new and complete. If you care to make the dynamo yourself, you will save half the cost, as the castings can be had in the rough for 16s., and the wire will cost about 2s. per lb. Switch, cut-outs, and leads or line wires will cost from 10s. to 15s. more, so that the whole installation will cost from £6 to £7, apart from cost of engine. I do not see why you must have a set of accumulators. These will only increase the cost, as each cell will involve an additional outlay of from 15s. to £1.—G. E. B.

Fretwork Cornice.—H. J. (*Kidderminster*).—It is not at all necessary that your fretwork cornice should be backed up with anything, though, of course, you may finish it by doing so if you wish. If you want a transparent, or rather a translucent, material, you cannot do better than use sarsanet, which may be the stuff you describe as being something like satin and unsuitable, because it is not transparent enough. The other material about which you inquire is gelatine in the form of thin sheets. It is transparent, but quite useless for the purpose, and no better than thin oiled tissue-paper would be. If you want to drape or, as you say, hang something below the wood to give a finish, I cannot suggest anything better than festoons of velvet or other suitable stuff, of which you will be able to get a large choice at any good house-furnisher's in your town. Loop the festoons with fancy cord, and trim edges with a ball fringe. Unless you have had practical experience in upholstery draping, you are not likely to make a success with the work, which requires not only skill but considerable taste, if the materials are to be used to advantage.—D. A.

Banjo Case.—LIVERPOOL.—You must make your case as light as possible if you make it of wood. If your wood is very thick, and you have to carry the banjo and case any distance, you will find that it will begin to weigh rather heavy before you get to your destination. The lightest cases are those made of cardboard and covered with American cloth, which answer very well for ordinary wear. You could rebate the sides of case to receive top and bottom, which could be glued and bradded (or sprigged) in. You can get the size from your banjo and make to fit it. Make the sides in one piece, and after the top and bottom are fixed, cut all round with saw, say 1 in. from top. Having done so, you will have your lid ready made, and, of course, the exact size and shape of the body of case. You could cut out the bottom to size, and then fit your sides round it, mitreing them together, and screwing or bradding, and not forgetting the glue. You could butt the ends of each section together, but it would not be such a good job as mitreing them. Line the inside with baize or plush, and paint or stain the outside to your own fancy. Put the hinges on extreme ends of case: if you do not attend to this you will find your case will not open and shut properly. You will see where to put them if you lay the lid on case and then lift it (the lid) up as if you were opening the case. You will see the shape by referring to illustration.—J. G. W.



Banjo Case.

American Clock.—P. W. W. (*North Shields*).—Neither from your sketch nor letter can I make out the arrangement of wires. I think that the centre wire is used merely to let off striking by a piece of wire hanging from it, in the event of running down, to obviate turning the hands; and as you say the clockmakers there do not understand it, having the whole affair before them, I feel more at a loss with only two wires to look at.—A. B. C.

Inlaid Tops, etc.—A. J. G.—If you want a quantity of these, any marquetry cutter will do them for you. Probably the most likely place to meet with them in London (you do not give your place of residence) is at D. Witt & Palmer's, Drummond Street, N.W.; or you might try some of the fancy veneer dealers in and about Curtain Road. There is a book called the "Practical Cabinet Maker," which might help you; though, unless you are what its name indicates, it is not likely to be of much use to you. You will find more valuable information in the volumes of WORK already issued in all that pertains to cabinet making than in any work I know of.—D. A.

Varnish.—J. S. (*Govan*).—The shellac spirit varnish to which you refer is, in reality, French polish. It will dry hard, with a good and lasting gloss, but is generally, indeed I may say invariably, applied with a rubber, and not with a brush. I know of no way in which it can be made transparent or limpid, like water, when in bulk. When applied to work, the film is so thin that it is transparent. The proportions required to make half a gallon, or any other quantity, must depend on what thickness you want it to be. Good ordinary French polish may be made by dissolving about 1½ lbs. shellac in half a gallon of methylated spirit; if you want it thicker, add shellac to suit yourself, or add resin instead. It is a pity you did not state what purpose you want to use the varnish for, as I might then have advised you something more suitable. In any case, console yourself with the reflection that varnish of most kinds can be bought more cheaply and of better quality than it can be made by amateurs. As you are so near Glasgow, you will be able to get the kind best adapted to your purpose, whatever it may be, without difficulty.—D. D.

Weight of Cordage.—R. J. S. (*Wolverhampton*).—The method of finding the weight of rope given by me on page 6, column 3, of WORK, No. 135, Vol. III., is from a book published by Routledge & Co. It is there stated to be "a good formula by Robison." Of course I had no means of testing the accuracy of it; but as apparently a good authority was given for it, I considered I was justified in adopting it. Your correspondent does not say absolutely that this formula is *wrong*, but merely that another authority—which, he states, is generally accepted by the trade as correct—gives a different result for the size of rope in question. My only connection with cordage is from having used and worked it for a full half century; and I must, therefore, admit my ignorance of the matter from a "trade" point of view, and, consequently, that I have never seen "Rabson's Tables." As the matter stands, it seems to me a case of Rabson *v.* Robison; and, as I take it, neither your correspondent nor myself is in a position to say *positively* which is in the right.—L. L. H.

Piano Panel.—INQUIRER.—Those most likely to have what you want are J. H. Skinner & Co., East Dereham, and Harger Bros., Settle. You might also write to Zilles. If you cannot meet with what you want, you may be able to adapt some of the published designs. There will be no difficulty in getting the wood you want, either in your own town or in Shrewsbury; but if you cannot meet with any, you can get it from the dealers above named, or from Busschott's, Park Lane, Liverpool, where I saw some very fine stuff lately. I am assuming you want plain or American walnut. If you want the Italian or burr walnut, you must get it in veneers, and either lay or have it laid for you.—D. A.

Polishing Marble.—W. B. (*Camberwell*).—Grind down first with coarse sand and water, then with finer, and finish off with putty-powder on felt mounted on a thick board. See details on p. 742, No. 98, Vol. II. of WORK.—D. A.

Box Battery.—J. H. (*Leicester*).—I suspect the cause of failure in your box battery to be due to corrosion of the connections by acid fumes arising from the cells. There may be an imperfect contact of carbon plates and the lead ring in which they were cast. Try the battery with a new solution. If this fails to light the lamp, you may determine on the fault being in the connections. If the battery lights the lamp when charged with the new solution, then the old solution was at fault. You adopted the right proportions—namely, 3 oz. of chromic acid and 3 oz. of sulphuric acid in each pint of water. The cost is rather high, 3d. per pint being quite enough. Good commercial acid is quite good enough. Let the solution cool before placing it in the cells, and see that the zinc plates are well amalgamated. The lead collars and the tops of the carbons should be painted with Brunswick black to keep the acids from creeping up and corroding the connections.—G. E. B.

Coupling Battery Cells in Parallel.—DENNY.—The resistance of a circuit is not increased by coupling up battery cells in parallel. On the contrary, each cell added to the circuit adds its own current to the general volume, without adding extra resistance to the circuit. Suppose we wish to convey water from one cistern to another, and put in two 1 in. pipes between the two cisterns in parallel. These will convey a certain quantity of water. We now put in an additional ½ in. pipe parallel to the two others. Although this in itself offers a higher resistance to the water than the 1 in. pipes, it does not in any way affect the resistance of the other pipes. It is much the same with cells. The partly exhausted Leclanché cell will not increase the resistance of the circuit when connected in parallel.—G. E. B.

Cabinet.—T. L. (*Balham*).—In due time there will appear a paper on how to make a canted-sides cabinet.—J. S.

Banjo Rim.—J. H. (*Everton*).—You ask for the best way to make a banjo rim, but you do not say if it is to be wood or metal. Supposing you wish to bend a piece of wood for a hoop, you must make a mould to size of diameter of hoop—an iron ring would be the best; or if you could find a pulley about the right size, you could bend it round the outside of that, using eight cramps to keep it to shape of pulley until you get it bent round in a circle, then drive in about three wire brads to keep it in shape. Failing the iron ring or pulley, you could cut a mould out of a piece of hard wood, turning it up to size or cutting it out with a band saw, boring holes round it or cutting out inside to allow the cramps to fix on. Prepare your wood, making it 2½ in. deep and ⅜ in. thick, cutting it to length according to the size you want the hoop, allowing for the ends to lap over each other about 3 in.; taper each end for splicing before you bend it; then steam or boil it well, and bend round the mould, using the cramps, and not forgetting to drive three or four wire brads into the ends lapping over one another, to keep it in shape when taken from the mould. The longer you can let it stand to dry, the better. Then take out the brads. See that the ends lapping over each other fit. Tooth them—you could do this by holding a tenon saw crossways on hoop, and drawing along with a

scraping motion, failing a proper tool—glue together, using hand-screws; then when glue is set, dress up the joint with spokeshave, which will make the hoop round enough for all practical purposes. Round the edge that the vellum stretches over carefully, so that there is no danger of wood cutting the vellum; then fit the band for pulling the vellum tight. The best bands are fitted to the hoops, and ends brazed together, and then are mounted in the lathe and have a recess or rebate turned in them; the object of the recess being to keep the nose of the bracket wires from cutting the vellum, which they would most certainly do if you used only a thin piece of brass for the band. Instead of making a recess in the band, get a piece of brass ½ in. wide and ⅛ in. thick, and bend it round to size of hoop: braze the ends together or halve and rivet them. Mark off and drill holes for brackets; fix ditto (using not less than twenty or twenty-four for an 11 in. or 12 in. hoop); put the band on hoop, and mark the exact place of each bracket on the band; then fill notches in band deep enough to sink the bracket wires into, and so prevent them from cutting the vellum. You will then have a band good enough for anything. If the information you require is how to make a metal hoop, I must refer you to what I have written in the back numbers. I have given the numbers in answer to a query by another correspondent, which has not appeared up to the time of writing this, but which, no doubt, you will have seen before this is printed. I forgot to say that you could use two drain pipes, one stuck on top of the other, the joint made good with clay, filling with water, and lighting a fire round bottom of pipe, to steam and bend your wood. This method was suggested by a correspondent in a contemporary of "ours."—J. G. W.

Banjo Making.—F. W. (*Southsea*).—I should advise you to use pegs in place of machine if you intend to put gut strings on your banjo. A machine is simply a nuisance for using with gut strings, but is very necessary for wire strings. For instance, a zither banjo having all wire strings would require a machine—wire strings being difficult to tune with pegs. For the latter part of your query see advertising columns. See also WORK, No. 88, Vol. II. —J. G. W.

Pine Harp.—S. E. (*Chelmsford*).—I can give no reliable information on this instrument. It is probably one of the home-made tribe used by "variety artists," and as a musical instrument has not come under my notice.—R. F.

Clock Cleaning.—VULCAN No. 2.—I am not sure I quite understand your difficulty about the striking, but in most French clocks the fly is pivoted, on the pinion end, in a movable eccentric bush. By turning this to throw the fly-pinion deeper in the warning-wheel, it will strike slower. To make it go faster, turn it shallower. As regards the German clocks, if not provided with a movable bush, see that the fly is tight on the pinion, as sometimes the pinion rushes round without the fly or fan piece; and sometimes the pinions are worn and the holes are wide. If so, put new holes to the fly and new wires to the pinion of the fly, and I think you will have no further difficulty. I can recommend Britten's "Watch and Clock Makers' Handbook."—A. B. C.

WORK Paging.—The numbering of the Advertisement pages of WORK must continue. Thank you, however, for your suggestion.

Pattern-Making Book.—G. S. (*Headington*).—There is a book on "Pattern Making" published by Crosby Lockwood, 7, Stationers' Hall Court, at 7s. 6d. That is a practical work, and might suit you.—J.

Cleaning Tools.—H. W. (*Rochester*).—Rub any rust off with emery-cloth; and if the tools are in occasional use, rub with sweet oil. If they are to be put away for a considerable time, rub with mutton fat.—J.

Testing Paint.—A. F. (*St. Leonards*).—The most practical way of testing oxide paint would be an examination as to colour and degree of fineness in grinding. I assume you mean the oxide in paste form, and not diluted with oils for use; as, in the latter case, the oil would be a factor of importance—whether good "honest linseed" or "fishy" oil, in the twofold sense. Oxide is so cheap, there is no need to adulterate it, although there are several qualities of colour (brightness) and fineness. In actual use the oil is more the preservative than the oxide, which is rather a *cheap* body pigment with affinity to ironwork.—F. P.

Graining and Painted Inlays. — THE SCRATCHER writes:—"In WORK, No. 100, is a paper on Graining. I beg to differ with the writer with respect to treatment of panels Nos. 7 and 8. I agree with him so far as he treats the maple up to the varnishing; but I fail to see how he can get a good imitation of walnut by the way he suggests, seeing that he has not laid down a proper ground for walnut: and it is impossible to get a good imitation on maple. In my opinion, the manner given in this paper, 'How to Treat Panels,' Nos. 7 and 8, are somewhat roundabout, and I am afraid the finish would not be as satisfactory in practice as it is set forth in theory. If I may suggest a method, it is this: maple your panel as stated, then pounce on the design, and fill in the design with a walnut *ground in oil;* let same dry, then grain over with walnut in distemper, as stated in your paper. Then take a fine pencil and go over the design with a little mixed turpentine and varnish; you will find very little difficulty in following the design you wish to fasten with this mixture of turps and varnish, as the walnut ground, being so much darker than the maple, will be perceptible through the graining. When dry, rub over with sponge and warm water, which will remove all the graining colour not required, and leave your design intact. To work your ebony ornaments, mix some lamp-black in beer, and coat over the panel where the ebony is required; then pounce the design on this black, and with the mixture of turps and varnish trace over the design to fasten: when dry, take sponge and water, and treat the same as the walnut. When these directions have been followed, go over the whole of the panel with a light-coloured varnish, so as not to darken the maple. In the article on Graining, I suppose the writer took it for granted that the amateur was capable of laying in and finishing a maple panel, as he fails to explain to him how to do either. When I took up my paper and saw the article above referred to, I thought that it would contain some useful information respecting graining, but found it simply treated with the decorative art proper, without giving a single method of how to imitate grained wood. I would like to point out that the decorator and the grainer are two distinct workmen."—[Notwithstanding the main portion of your criticism is based upon its writer's own misconceptions, it is but fair that your well-intentioned letter should be fully answered, if only from the fact that it is the only occasion of any directions contained in the "Art of Graining" having been questioned as to their practical reliability. Taking your points *seriatim*, which refer to the instructions on pages 772 and 774 (No. 100, Vol. II.), you "fail to see how he can get a good imitation of walnut by the way he suggests, seeing that he has not laid down a proper ground for walnut, and it is impossible to get a good imitation on maple." In answer to this, I would ask you—presuming you are a practical grainer—how much walnut figure it would be worth one's while to imitate on the dark ornament of panel No. 7? Scarcely any, I say, and therefore the main point of inlay work—real or imitation—is worked on the principal of contrast, of colour, or of shade. But here your practical knowledge of painted inlays must be very limited, since you say that to get a good imitation, the fine ornament of panel 7 must "be grounded for walnut." It is a matter of mere general comprehension that such an opaque coating of body-paint cannot be pencilled on or stencilled without showing a perceptible thickness, and which, when varnished, would have as much claim to imitation carving—wood in relief—as it would have to being inlaid—"let into." I say it most emphatically, that for purposes of ornamental inlaying, walnut, rosewood, etc., are best worked upon the "ground" of the lightest wood, and that in no case can good work be done by grounding each wood in its own special colour. I assume that "inlay imitation" is interpreted by my readers in accordance with the appearance of real marquetry, and not simply as one kind of wood colour painted partly over the surface of another. Further on you question the value of the "stopping-out" process as "being roundabout." Compared to pencilling in the ground for the ornament of panel 7, as you advise, stopping-out is simplicity itself. That it appears odd to you, and many grainers who may never have attempted anything out of the ordinary groove of graining, is very probable; but it declares at once that your criticism is based solely upon a limited practice and effort. The concluding article in No. 103 doubtless made things plainer to you, but it may be interesting to mention that one variation of the principle of "stopping-out," as applied to *stained imitation inlays*, was patented by a prominent metropolitan decorative artist, Mr. Andrew F. Brophy, about twenty years ago, examples of which work were shown by the eminent London firm, Messrs. Trollope, in the 1871 Exhibition. Further on, your ideas as to ebony, or black stencilling, on maple are scarcely more than items of very ordinary knowledge, to which a plain stencil of gold size and ivory-black (ground in turps) would be superior. Finally, you say that the writer took it for granted that the reader knew all about grounds and graining all varieties of wood, as I "fail to explain how to do either," and that you would like to inform me "that the decorator and grainer are two distinct workmen." I hope by the time this is published you will have gathered that the two inlay papers were the last of a *series of fifteen*, dealing on each and every practical aspect and process of imitating woods, preparation, grounds, graining colours, and manipulative treatment. As to the "distinct workman," such is, in many instances, the case, *unfortunately* for decorative art in general and the ordinary grainer in particular. Had the grainers of "the old school" possessed a better understanding of how far graining is a branch of decorative work, it would never have fallen to its present debased standing as an industrial or decorative art. For the individual grainer who is not a decorator in a fair sense of the word, there is yet some hope. If, as we earnestly hope, the Painter-Stainers Company call the proposed conference of the trade in the autumn, to consider the Technical Education of the Painting Trade, it is within the bounds of possibility that many more scratchers may acquire a practical knowledge, not only of graining and inlaying, but of designing, decorating, and the control of colour, such as many able judges to-day can credit to LONDON DECORATOR.]

Paint, etc.—F. L. B. (*No Address*).—(1) One of the most useful and reliable spirit lamps for burning off old paint is the patent "Paquelin." Its price is 12s. complete, and it is a simple contrivance, of which any parts may be renewed. Its chief advantages are: burning in any position, its great heat, simplicity of use and lightness. The cost of working it is about a halfpenny per hour. (2) For silvered plate, G. Farmiloe & Sons, Rochester Row, London; or Cashmore & Sons, Bristol, might suit you. This firm make up a quantity of their own small sizes into very cheap overmantles, thus saving waste or loss on small sizes in their stock. Remember the quantity bought has much to do with the price to the trade buyer. (3) The sashes which, after being painted, do not run well, are probably overloaded with paint in the runners. Remedy: clean off with a plumber's shave-hook and then repaint with two bare coats of *hard-drying* paint.—F. P.

Paint, etc.—No. 305.—Respecting your cement wall-skirting—or "boards," as you term them—you do not say how long intervened between finishing the skirting with Parian cement and painting it; "at once" is rather an elastic term. If the Parian was painted on the same day, that is an error of judgment, I think. Moisture is certainly the cause of the paint not drying, and probably of the roughness "at the edges;" this again is not sufficiently plain for the purpose. Notwithstanding all that plasterers may say to the contrary, I should not, as a practical decorator, like to paint Parian until three days after finishing. If the "roughing in" mortar be thoroughly dry and hard, and a thin coating of Parian only skimmed over it, a day might be long enough before painting. I should say in your case the Portland was either not dry and the moisture effected the finish, or else that the moisture of the Parian, instead of drying inwards, was prevented by the nature of the Portland from so doing, and the damp, therefore, came out on the face of the work. Roughness is often caused, after a time, by chemical action of paint and wall.—F. P.

Painter.—MIGRATORY.—The South Wales ports, Swansea, Cardiff, and Newport, have good seasons of your trade, whilst the northern ports of Liverpool, etc., are large centres of work also. The wages paid to house-painters in these large towns is about 7d. per hour in the south, and 7½d. in the north. As to time of year, March and thereabouts is a good date anywhere, and, of course, between October and February is the worst period for a stranger. The most important factor of the whole question is the amount of your own trade ability, steadiness, energy, and common sense.—F. P.

Repairing Waterproof.—W. H. (*Rawden*).—In order for you to repair a mackintosh in which the seams are giving out, it is necessary to provide some naphtha spirit—such as is used by makers of india-rubber waterproofs—and a small tin of pure rubber solution, which is generally to be purchased at the waterproofer's. Having got these, spread out the mackintosh on a firm table, and with a small brush anoint the two surfaces of the seam, where it has come apart, with naphtha, which will soften the old rubber and dissolve the dirt and grease. Care must be taken not to let the naphtha extend beyond the lap of the seams; and after it has been on the surface for some ten minutes or so, you may then apply the solution, taking care not to smear it on the surface of the mackintosh, or to let it extend further than the lap of the seams. Now match the lap carefully and evenly along, and then with a heavy flat-iron press down, and bring the two surfaces into close contact, so as to squeeze out any air that may be between them; and when this has been neatly done, go on with the rest of the seam in a similar manner, until the repairs are completed, when the mackintosh should be spread out so as to allow the naphtha to evaporate and the joints to harden. It should be borne in mind that it is a very wrong plan to fold or bundle up a mackintosh after wearing, and put it away in that state until it is wanted again. So soon as it is taken off after use it should be hung up or spread out, so that the *inside* is exposed to the air; and thus the condensed moisture from the heat of the body is allowed to evaporate, and the damp or moist surface dries. One night of this treatment will ensure its being dry and fit for use the next day; and by practising this system the durability of such apparel will be largely increased, and the liability to the softening of the seams greatly reduced.—C. E.

Electric Light.—W. J. (*London, N.W.*).—To light up a room 12 ft. square, you should have three 10 c.p. lamps; these will absorb ⅓ h.p., and can be fed with current from a small dynamo or from a large battery; you would find the battery an intolerable nuisance. From your letter I should think that you have no idea of the cost and trouble of laying down a small electric light plant with batteries. I therefore advise you to read carefully the series of articles on "Model Electric Lights," published in WORK, Vol. II., Nos. 76, 82, 89, 92, 94, 97, 99, 101, and 104. This will tell you all about the batteries: how to make them, what acids to use, and how to arrange the lights. The whole set of numbers can be had from a newsvendor for 9d.—G. E. B.

American Clocks.—I. X. W. (*Glasgow*).—Do you mean American clocks with electric self-winding or clocks actuated by electricity? as I know nothing of the latter, whether any are made or no; but the former is, I know, and I daresay you can get them from J. J. Stockall, 6 and 8, Clerkenwell Road, London, as he is an importer of American clocks of every description. Write and ask him,

and no doubt he will forward his price list.—A. B. C.

Model Alliance Dynamo.—H. O. B. (*Manchester*).—You have omitted to give full dimensions with the drawing of the carcase of your dynamo, so I must guess at parts of the measurements. You have omitted the armature altogether. Supposing this to be a solid shuttle or H girder of 3 in. in length by 2 in. in diameter, you might get on it from 27 yds. to 28 yds. of No. 20 silk-covered copper wire. Supposing you have a wire space of 2 in. above and below the core (this having a diameter of 1¾ in. and a length of 4 in.), you might get on it about 6 lbs. of No. 26 silk-covered copper wire. Then, if the armature is driven at a speed of 3,000 revolutions per minute, you should get a current of from 2 to 2½ ampères at a pressure of from 18 to 20 volts; and this would be enough to light up a 20 volt 8 or 10 c.p. lamp.—G. E. B.

Model Manchester Dynamo.—J. McA. (*Glasgow*).—The drawing of your model toy dynamo is very good, and enables me to judge exactly its merits. It will make a very pretty toy, but nothing more. You could get no practical results from a Manchester dynamo having field-magnet cores ⅝ in. by 1¾ in., and a wire space of only ½ in. between the cores and the armature channel. I do not think you would get laminations so thin in the web as those shown in your sketch; and if you got them they would be useless, because they would not admit a sufficiently strong spindle. If this could be managed, you might get 25 yds. of No. 20 silk-covered wire on the armature. This would be equal to 16 yds. of active wire, and would develop a current of 14 volts with the machine driven at a speed of 3,000 revolutions per minute. But to balance this for any useful purpose, you should be able to wind the field-magnet cores with at least three times as much No. 26 silk-covered wire as they will now hold. With a solid wrought-iron armature wound with No. 20 wire, and No. 20 on the fields, you might make the machine into a motor.—G. E. B.

Geneva Watch.—R. I. (*Horsforth*).—Cylinder pivots are turned in the ordinary turns with a graver, and are then generally finished with a conical file and burnisher. The file and burnisher is like an ordinary flat one, but with just the corner rounded off; one corner being cut as the rest of the file, and the burnisher left smooth. These answer well enough for general work or jobbing, but for best work the pivots should be polished in with oil-stone dust, then rouge or red stuff, and finished with conical burnisher. Some pivots are made square, same as any other pivot, and then the shoulder turned off conical or at an angle of about 5° after the pivot is fitted and finished off. The ferrule generally used is simply a piece of brass with a hole in the centre slightly larger than the body of the cylinder and a groove turned in its edge to take the horse-hair of the bow. Take a bit of sealing-wax, and let a drop fall on the cylinder and fill it; this will make it stiffer and stand turning better. Then take the ferrule, make it hot enough to melt the wax, and slide it on the body of the cylinder. Clean the wax off the centre, and turn your pivots. When done, drop the cylinder and ferrule in a drop of methylated spirit, and gently boil it till all the wax is dissolved; then clean with pith and peg, and see that none is left inside it.—A. B. C.

"How to Make a Dynamo."—Messrs. Crosby Lockwood & Son, 7, Stationers' Hall Court, Ludgate Hill, E.C., request me to state that they are the publishers of the work under this title, to which reference is made in WORK, Vol. II., page 726.—ED.

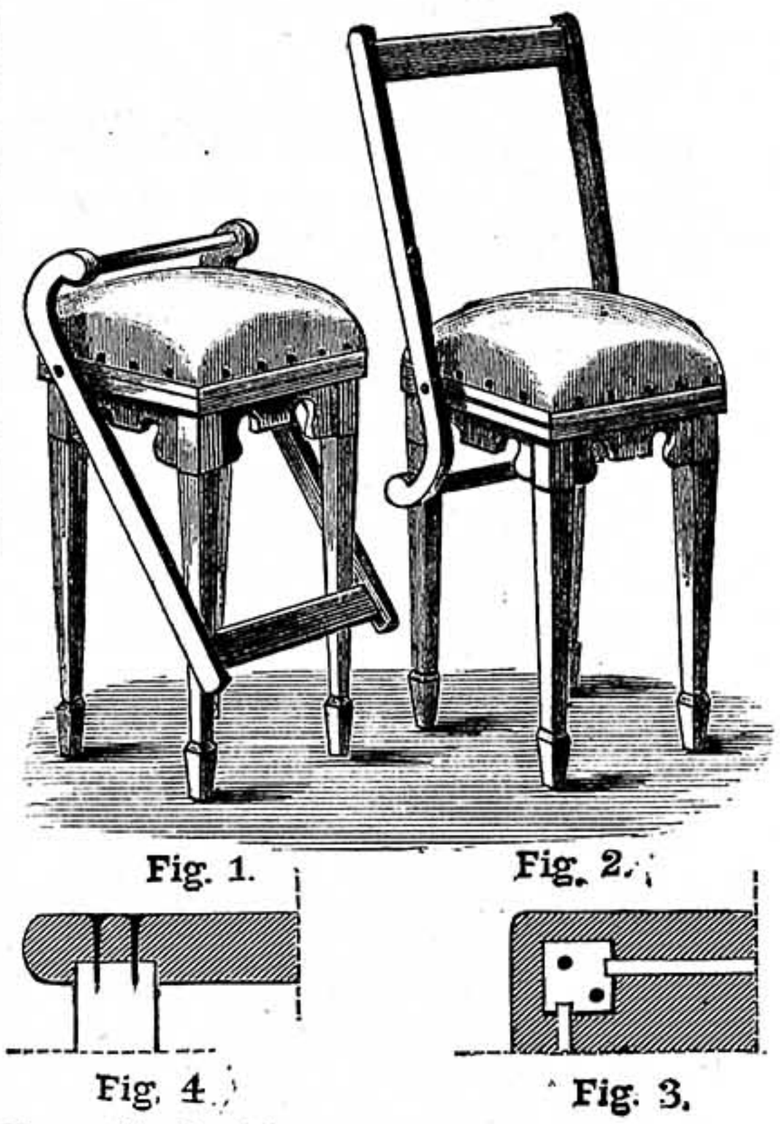
Violin Making.—J. S. R. (*Glasgow*).—As you will have seen by this time, the Violin Making articles commenced in No. 105, the first number of Vol. III.

Enlarging Drawings.—J. W. (*Edinburgh*).—Considerable mystification seems to prevail on this subject. When a drawing is said to be *half* size, it is considered to be half full size; and the drawing will be placed on and within an area *half the length* and *half the width* of the area on which a full-size working drawing is placed, and so on for other sizes. You say you wish to know how to raise or enlarge a drawing from full to half size, and you instance a certain drawing in page 760, Vol. II. of WORK, enclosed in a square 6 in. by 4 in. Supposing this to be half size, and you wish to enlarge it to full size: divide the area into ½ in. squares, and prepare another sheet of paper by dividing it into 1 in. squares. As the length and breadth of your *half-size* diagram are 6 in. and 4 in., the length and breadth of the *full-size* diagram will be 12 in. and 8 in. "Ah," you will say, "but the *area* of the full-size drawing will be *four* times that of the original." Precisely so: but in enlarging and reducing, the length and breadth only are taken into account, and not the area. Again, if you wish to reduce your 8 in. by 4 in. diagram to half size, divide your paper into ¼ in. squares, and the length and breadth of the half size will be 3 in. and 2 in. respectively. For quarter size, take ¼ of length and ¼ of breadth of original size for reduction. In this case the area will be ⅛th of original area; but, as I have said, in these cases you have only to deal with *length* and *breadth*.—ED.

Hammering Hand Saws.—ANXIOUS.—Purchase the Indexes to Vols. I. and II. of WORK. Much valuable information has already appeared upon the subject in WORK.

Watch-Cleaning Tools.—W. K. (*Heptonstall*).—You cannot do better than follow the instructions lately given in a series of articles in WORK. The tools you will require are really very few: a couple of watch brushes, a couple of small screwdrivers, an eye-glass to see the small holes, etc., are clean, and a piece of deal to make a small peg or two for cleaning the holes. The brushes, eye-glass, and screwdrivers may be got from the tool shops for about half a crown. You will want a bottle of watch oil for oiling it after it is cleaned. I find Ezra Kelley's is very good, and seldom use any other, either for watch or clock; also a little tissue paper to hold the pieces while brushing and cleaning. When cleaned, put under a glass, say a wine-glass, to keep the dust from them. When the brush gets dirty, rub it on a piece of chalk, then on a dry piece of bread. Use a stiff brush first, and finish off with a smooth one. Should you require any further instructions, write again.—A. B. C.

Piano Stool.—W. J. (*Portsea*).—As you do not wish your prospective piano stool to be of the screw species, I gather that you do not want an adjustable article. If my surmise be correct, you must select the height, etc., of the stool for yourself, taking an ordinary small chair as a guide. While preparing this reply, an "idea struck me," which idea, or the outcome of it, is shown in the adjustable back in Figs. 1 and 2. I give it as being useful by offering accommodation to anyone desirous of



Piano Stool. Figs. 1 and 2.—Stool with Back down and adjusted respectively. Figs. 3 and 4.—Elevation and Plan of One Corner respectively.

obtaining further support than music stools generally afford. The back might be a fixture, but it will be convenient in more ways than one if made as I suggest. First, decide upon its most suitable height. Then hold it over the stool, as in Fig. 2, and shift it to various angles, keeping the pivot hole always on a level with the seat, to arrive at the inclination most likely to be appreciated as comfortable. The bottom spindle affords all necessary resistance when the back is being leaned against. I advise you to have a tolerably stout board, and mortise it within and adjacent to its four corners to receive the tops of the legs, which could then be screwed in position from the top of the seat-board (as in Figs. 3 and 4). Previously, slightly mortise the inner surface of each leg-block to receive the ends of the shaped pieces shown between the legs. Whether you omit a stuffed seat or use one, I recommend you to do as I say. Mr. Adamson's "An Armchair," lately published in WORK, will give you all necessary details relative to upholstery. Have a very wide framing to which the stuffing may be attached, and secure it to the solid seat-board by screwing from underneath and through the latter. Write again, with fuller particulars, if you want a stool with a more presentable appearance than this possesses.—J. S.

Fret Machine.—A. McC. (*Holywood*).—Ask your questions, and the author of the paper on the fret machine will answer you through "Shop."

Enlarging Drawings.—J. W. B. (*Huddersfield*). I am obliged to you for your reply to J. W. (*Edinburgh*) on this subject, but it is not the kind of reply that will be helpful to him. He has, moreover, been answered by myself, and the *modus operandi* made clear to him.—ED.

Bass Bar, etc.—B. T. E. (*Carlisle*).—The functions of the bass bar are both mechanical *and* acoustic. If the bass bar has been so much trouble to you, how have you gone on about the sound-post? as this little article performs functions equally as important as the bass bar.—B.

Violoncello.—J. D. (*Glasgow*).—The distances you desire to know are regulated, in the first place, by the length of the upper portion of the instrument; and secondly, by the position of the sound-holes. The length of string from "nut" to bridge should be about 27 in. Thicknesses depend not only on the area, but also on the quality of the wood. State which outline you intend to follow. Taken roughly, the length of the bass bar should be three-fourths of the length of the belly.—B.

Violin Matters.—L. F. (*Plymouth*).—The "figure" of the wood is natural, not, as you suppose, artificial. I do not know where Helmholtz's resonators can be purchased. I think the best way would be to take off the finger-board, and make the butt of the neck hot, say with a piece of hot iron. This would soften the glue; and by working the neck slightly from side to side, it would ultimately come loose. You should, before doing this, insert a sharp knife between the ends of the ribs and the neck, and also between the "tab" and the back of the "butt." Perhaps strong ammonia would remove the oil you complain of; but my idea is that the instrument is ruined.—B.

Harmonium—Wood—Lubricant.—W. W. (*Chelsea*).—Your numerous and varied questions should be written upon separate pieces of paper. Instructions on building an American organ will shortly appear.

Scene Painting.—J. M. N. (*Newcastle-on-Tyne*).—To become a professional "scenic artist" requires proper tuition, for which you have to pay a premium. The sum mentioned—viz., fifteen pounds—would indeed be low. There must also be the artistic taste, or all tuition is useless.—W. C.

Earth.—AUCKLAND.—We are unable, without making a qualitative chemical analysis, to give AUCKLAND any definite information as to the composition of the "yellow substance" contained in the sample of earth forwarded. If so disposed, you can have either a qualitative or quantitative analysis made. Analysts' fees vary; say one and a half guineas for a qualitative analysis, and two and a half guineas for a quantitative. We decline to recommend an analyst.—CHEMICUS.

Incubator.—W. S. (*Cambridge*).—A tray of water placed above the eggs, as suggested by you, would certainly be an improvement, were it not for the fact that the said tray would prevent the heat from tank being radiated on to the eggs. This being so, your plan will not answer. I would suggest a piece of sponge charged with hot water (replenished twice a day when airing the eggs) placed in a shallow cup in centre of egg drawer. Water would probably slop, hence the sponge.—LEGHORN.

Clock.—LOOKER ON asks, "What is the best clock for one to buy—either old grandfather or American, or any other make? price no object; a really good substantial article. How to know a good one when shown of any make?" It would have been more satisfactory if LOOKER ON had stated for what position and purpose he desires a clock, as that makes a great difference as to size and construction. But as he appears to put a general question, I will answer it in a general way. It may be taken as undeniable that high-water mark as regards time-keeping qualities is reached by clocks having the shape of the grandfather type. The best results are to be obtained from clocks with weights and long pendulums, as distinguished from those with springs and short pendulums. A common grandfather clock, if placed in a steady position and well regulated, should be made to keep better time than an expensive mantelpiece or bracket clock with springs and short pendulums. The most accurate style of clock is that used by watchmakers for "timing" purposes, and generally known as a "regulator." The best regulators have comparatively light weights—their mechanism being so delicate as to require little driving—and long mercurial pendulums. A first-class regulator may cost as high as £100. But LOOKER ON, unless he is an astronomer, can scarcely require anything so fine as this. I would advise him to try and pick up a second-hand watchmaker's regulator. A good one can often be had for from £10 to £20. Many good watchmakers have two, and even three, regulators, in which case one of the clocks will be that which they began with in their early days, and which, though not quite up to the mark from a scientific point of view, would be more than first-class for ordinary private purposes. Watchmakers are often disposed to part with a clock of this sort. As regards the last query, "How to know a good one when shown of any make?"—the obvious reply is that the way to know a good clock is to thoroughly understand the mechanism of clocks. Without such technical knowledge, neither LOOKER ON nor anyone else can tell a good clock from a bad one, except as far as the case and the outside appearance are concerned. The only general advice I can give him is that he should select a clock with weights and long pendulum. For the rest, he must either rely on his own technical knowledge or on the honesty of some reliable person in the trade.—HERR SPRING.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Window Flower Boxes.—J. K. T. (*Perth*) writes:—"Could any reader give me some designs for window flower boxes in WORK? The season is now coming on for flowers to be put in the windows."

Teasing Hair.—A. A. (*Edinburgh*) writes:—"Will any reader give me information in regard to a machine for teasing hair by motive power, or, if they can be bought ready made, the maker's name and address? I would not like a very large machine—one capable of teasing 80 lbs. to 100 lbs. per hour. I would prefer to make the machine, if not too intricate."

Pen.—J. R. (*Walton-le-Dale*) writes:—"Will any reader tell me how to make pens that require no ink? I have seen one, and should like to know all the materials for making them."

Air-Proofing.—F. G. B. (*Brixton*) writes:—"Can any reader inform me how to render calico or linen perfectly and permanently air-proof?"

Wood and Ivory Balls.—F. G. B. (*Brixton*) writes:—"I shall be obliged if any reader can tell me if turned wood balls can be used for playing billiards (as ivory balls are so expensive), what kind of wood is suitable, and where could I get them?"

Black Lead.—F. P. (*Leeds*) wants to know if any of our readers can tell him how manufacturers put such a polish on blocks of black lead? He has made black lead into blocks, but cannot get a polish on the outside. A recipe for a good stove polish would be esteemed.

Gas Engine.—H. R. P. (*Nottingham*) writes:—"I shall be glad to know where I can obtain castings, instructions, and working drawings for making small gas engine."

Fountain Pen.—A. B. (*London, S.E.*) writes:—"I would like to construct a fountain pen; if you or your readers could give me sketches and particulars, you would much oblige."

Brass Whistle.—CLARIONETTE PLAYER writes:—"Would a correspondent kindly tell me how to make a brass whistle in as deep a tone as it is possible to make it, giving accurate size and pitch of holes? I have several pieces of good tubing, and every size up to ¾ in. internal measurement."

Setting out Teeth and Cogs.—X. (*Liverpool*) writes:—"I would consider it a great favour if you would give a plain method of setting out and proportioning the teeth of wheels, bevel cogs, and wooden cogs; and if any figures are wanted, let them be plain."

Combined Bench and Tool Chest.—T. R. B. (*Wandsworth*) writes:—"Will any reader kindly give me a design and instructions how to make a simple bench and tool chest combined, about 5 ft. 6 in. long, and 1 ft. 6 in. wide, to stand in corner of room, one side and one end against wall, but cased in and constructed to take apart easily if required?"

Brush Making.—B. S. (*Acton*) writes:—"Would any reader kindly inform me in 'Shop' where I could procure the wooden backs or handles for clothes brushes ready bored for receiving hair? Also the wire for pulling in same? I have a quantity of horse-hair I would like to make into brushes if the backs are procurable."

Cattle Marks.—J. H. M. (*Meath*) writes:—"I will feel obliged to be informed if there is any dye which would answer for marking cattle—a substitute for the tar brand, which does not last once the hair grows; if it would mark the skin, all the better. As there are so many cattle now that have had their horns taken off, it is hard to know how to mark them so that the mark will last for any length of time."

Fire-Lighters.—PHŒNIX writes:—"I shall be grateful if any reader can give full instructions for making fire-lighters (composition)."

Colouring Photographs.—A. F. M. (*Glasgow*) writes:—"I employ a good deal of my spare time in colouring photographs by the crystoleum process; and my experience (a pretty long one) is that the fixing on the glass with starch is not satisfactory. No matter how carefully done, glistening specks appear; it takes up a great deal of time; you are very liable to break the glass or tear the picture; and in rubbing down, if you intend to wax the picture, the photo is liable to lift in places, or, if you use a cleaning medium, it lifts in places at the edges. Although I have done many successful pictures, this is my experience; and I would be obliged if some of your numerous subscribers could favour me with a recipe for a cement which will fix the picture firm, quite transparent, without speck, and will not require the trouble and danger of rubbing out spots or air bubbles for any length of time, like starch."

Checkering.—CHECKERED writes:—"I should feel obliged to be informed how best to checker leather; also the tools or appliances requisite for the purpose."

Petroleum Motors.—CONSTANT READER writes:—"I should feel obliged if any of our readers would give me information on the above—their working, and the advantages they have over gas motors."

Mandrel Head.—M. H. (*Maiden Newton*) writes:—"I have just completed a mandrel head, the mandrel running through one brass bearing, and supported by a back centre. I now wish to make a 5 in. head, with the mandrel running through both front and rear of the head. Can any correspondent tell me if borings through the solid cast iron will prove a sufficiently permanent bearing, or had I better have brass bearings? I also think of adopting the parallel bored collars of traversing mandrels, though it is not my intention to add guide screws. Is this plan or a back centre best for a lathe for general use?"

Photo-Lithography.—PEN AND INK writes:—"I shall feel much obliged to any reader who will give me information on any branch of lithography or zincography."

Bass.—E. B. M (*Tunbridge Wells*) would be obliged to any reader of WORK for information as to where he could purchase a small quantity of bass (I think it is called), the same as brooms are made of; it is also used for sweeps' machine brush-heads.

Briar Wood.—J. R. N. (*London, N.*) writes:—"Will any reader kindly inform me of a dealer in London from whom I can obtain briar root for pipe making?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Leclanché Battery.—F. S. (*Carlisle*) writes, in reply to C. F. W. N. (*Forest Gate*) (see page 78, Vol. III.):—"You will be able to get a Leclanché battery of two cells, all complete, of J. Halhead, chemist, Carlisle, for 3s., which will answer the purpose for which you require it."

Preserving Ice.—M. (*Bishop Auckland*) writes, in reply to J. K. (*Middlesbro'*) (see page 78, Vol. III.):—"Make a box narrower at the bottom than the top, and bore holes in the bottom to allow water to run out. Set this on 1 ft. in thickness of faggots or reeds, over a trapped drain in the cellar. Line the inside 1 ft. thick with straw, and pack the ice in, broken into small pieces, adding a little water to make it freeze into a mass. Some advocate the addition of a little salt to form a freezing mixture. Cover with 1 ft. thick of straw; then cover box at least 2 ft. thick all round with non-conducting material (chaff or sawdust). You want to exclude all air, and allow any water to drain off at once."

Tin Labels.—THOMAS STEPHENS (*Paradise Street, West Bromwich*) writes, in answer to LABEL (see page 830, Vol. II.):—"We are in a position to supply any kind of stamped tin labels very cheaply."

Tin Labels.—W. NEEVES (*Southgate Street, Leicester*) writes, in reply to TIN LABELS (see page 830, Vol. II.), that "he makes a specialty of tin labels."

Enamelling Slates.—M. (*Bishop Auckland*) writes, in reply to J. D. (*Holyhead*) (see page 46, Vol. III.):—"The slate is polished smooth, then japanned or painted till of the required colour; the japan is hardened by stoving or baking. It is then smoothed with pumice-stone, and polished with rotten-stone. You might procure a book on the subject from Spon, 125, Strand; or Batsford, 54, High Holborn."

Enlarging Drawings.—G. M. (*Brixton*) writes, in answer to J. W. (*Edinburgh*) (see page 14, Vol. III.):—"The following rule will give the dimensions required: If a drawing is wanted half as large again, 'square each side, add half, and extract the square root.' Thus, suppose the original is 4 in. by 6 in.; the square of 4 is 16. To this add half (8), and this will give 24; the square root of this is 4·898 in., which is the measure of the shorter side. The longer side can be found in the same way, and will be found to be 7·348 in. If the drawing is wanted to be reduced, say to half the size, 'square each side; halve each, and extract the square root.' The sizes will be found to be 2·828 in. and 4·242 in. Both the above give the exact surface within a hundredth part of a square inch. Of course, they can be got nearer than this by carrying out the decimals farther. If J. W. wishes to know how the above rule is obtained, it can be demonstrated thus: In the case of enlarging, let x represent the size we want for the smaller side; then $x + \frac{x}{2}$ (because 6 is 4 and half of 4) represents the longer side; and then $x \times (x + \frac{x}{2}) = 36$. This, worked out, gives x equal to the square root of 24, which is the same as above."

Stain.—DOWN writes, in reply to S. S. (*Salford*) (see page 44, Vol. III.):—"To stain birch a mahogany colour, there is no simpler plan than dissolving some Bismarck brown in hot water and rubbing it into the wood with a rag. If the colour is too red, he can add a little vandyke brown to darken. It can then be polished in the usual way. I have often used the Bismarck brown alone with good results."

Castings.—H. E. (*London, N.W.*) writes, in reply to K. M. (*No Address*) (see page 14, Vol. III.):—"If you can get castings at 7s. per cwt., don't attempt to cast them yourself in such small lots as 1 cwt. or 2 cwt. per day, as they will then cost you half as much again. If you were casting tons instead of cwts. you could not do them much cheaper."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—H. D. (*Hull*); A WORKING MAN; P. Q.; THE VICTOR CYCLE CO.; H. W. (*London, S.W.*); SOCRATES; W. S. S. (*Bristol*); T. M. (*Southampton*); A. H. W. (*Newcastle*); A. B. & Co. (*Belfast*); J. B. (*Leicester*); E. C. O. (*London, S.W.*); S. H. (*Rochdale*); LETTER CUTTER; H. S. (*Ipswich*); A. B. C. (*Newton Abbot*); INCUBATOR; H. H. L. (*Higher Bebington*); LITHO; G. S. (*Craven*); NEW READER; W. H. O. P. (*London, N.E.*); A. W. (*Aberdeen*); CYLINDER; J. W. E. (*South Darenth*); T. N. (*Halifax*); W. H. (*Penzance*); L. W. L. (*Wolverhampton*); PORTABLE HARMONIUM; A. R. (*Blackburn*); WUERDLE; F. E. B. (*Hull*); R. V. B. (*Peckham, S.E.*); RULER; G. H. S. (*Kensington*); Z. Z. Z. (*Wednesbury*); T. A. (*London, S.E.*); J. S. (*Amsterdam*); T. F. (*Tamworth*); W. G. M. (*Limpharan*); A REGULAR SUBSCRIBER; H. S. (*Oxford*); W. B. R. (*Westbury*); S. R. (*Withington*); T. R. L. (*Hulme*); W. B. (*London, N.*); SOLDAT; A. A. M. (*Clapton*); J. A. B. (*Leicester*); S. O. R. (*Nuneaton*); J. D. (*London, N.*); F. J. C. (*London, E.C.*); M. O. D. (*Hackney*); A SUBSCRIBER FROM THE FIRST; FRENCH POLISHER; NEVER DESPAIR; AJAX.

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